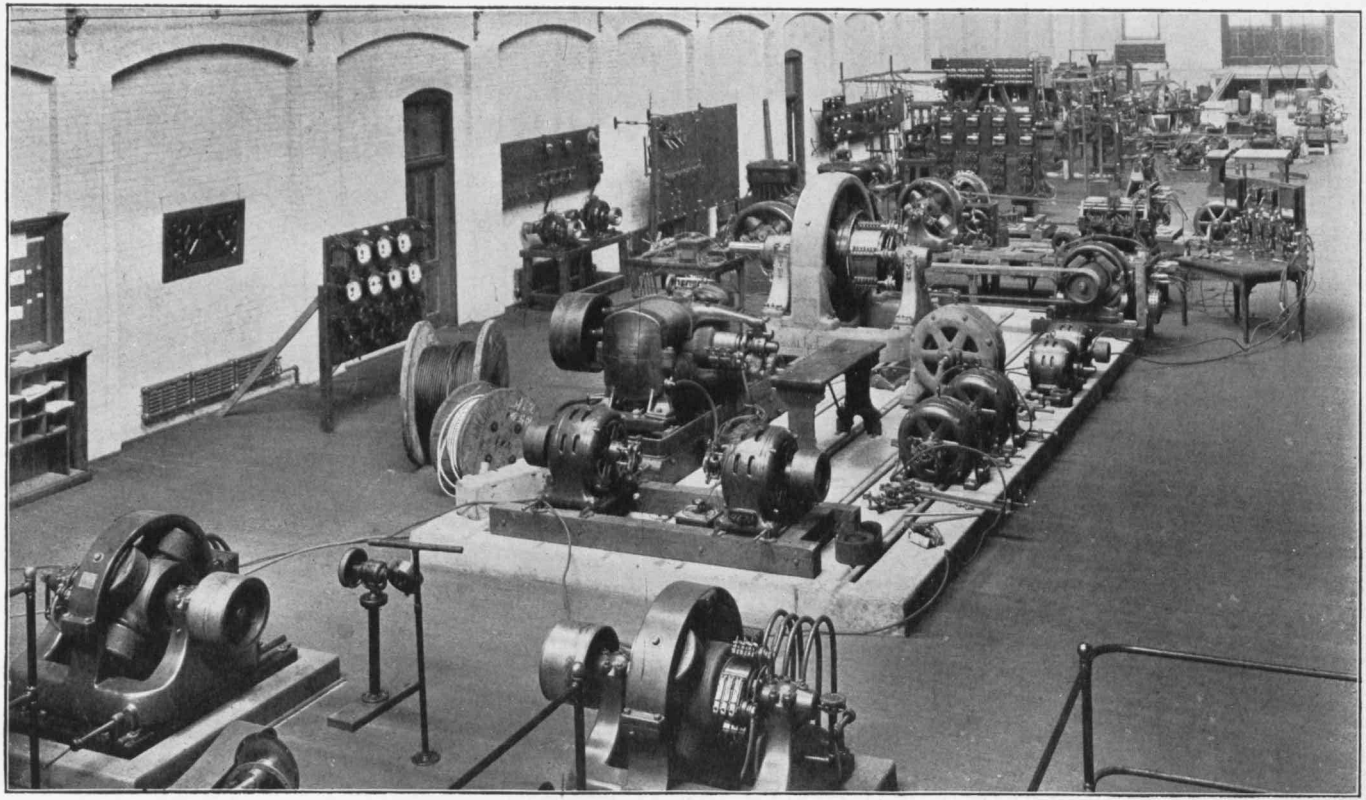

LABORATORY OF DYNAMO-ELECTRIC MACHINERY, LOOKING SOUTH

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THE AUGUSTUS LOWELL LABORATORIES OF ELECTRICAL ENGINEERING

If one were to express briefly the distinction between the engineer and the skilled artisan, he would characterize the ability of the one as determined by his length of head and of the other by his length of arm. With the engineer the prime motor is brain, with the artisan muscle. This in no sense indicates a lack of intelligence among artisans, and it is in fact just this intelligence which has given the United States her present industrial supremacy. But the point is just this. The engineer thinks out a problem, and then directs the way to its successful accomplishment; while the artisan, unless working under direction, accomplishes, if at all, by trial and error.

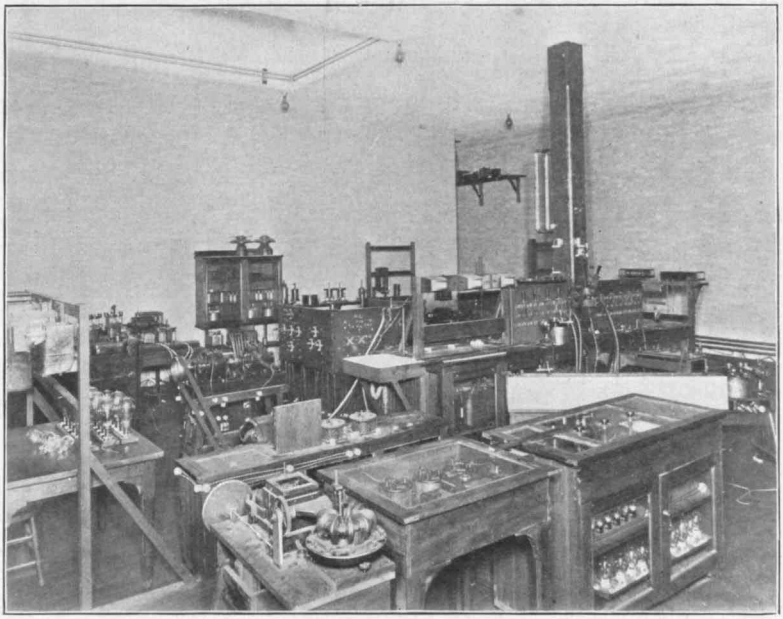
Any system of technical education which does not fit its students to *think* out the problems of engineering is certainly not the highest type. To get the student to bring to bear upon any question the sum of knowledge which he has acquired in his course of training is something very difficult of accomplishment. With the facilities of the modern engineering laboratory it is so much easier to experiment than to think; and it is frequently the case that the obtaining of results takes the place of their being assimilated and properly understood.

The satisfaction of the student in mere performance is

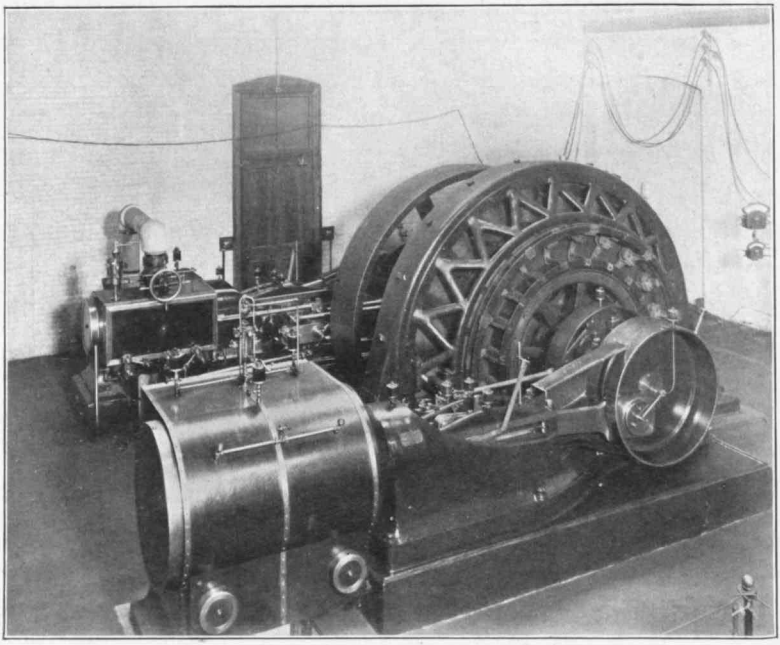
a real menace to the success of the laboratory system. How frequently do we observe the carrying out of some piece of complicated experimentation, requiring the services of fifteen or twenty students, each one of whom performs some part in the securing of the required data, without any general discussion of the problem in hand, the significance of the results, their bearing on and relation to current engineering practice. In fact, a process of digestion and assimilation is lacking. The food is there, properly, and frequently too attractively, prepared; but the organs of digestion never have the opportunity to act. In much of the laboratory work of to-day there is too often the suggestion of the predigested food. The student finds apparatus in adjustment, takes certain readings, enters his results on sheets specially furnished, makes certain plots on properly prepared paper, and passes on to some other experiment. He has no opportunity to show his appreciation of the apparatus in hand, to apply his knowledge of fundamental principles, nor is there any test of his conception of the bearing of his work on engineering reality. All this is no help to virility of mind, to sense of personal responsibility, to power of analysis, to the exercise of judgment, to the most important thing of all, the acquirement of the scientific spirit.

The necessity of serving the large classes who now make demands upon the laboratories of the technical schools is sometimes offered as an excuse for requiring less in initiative from the student. Would it not conduce to sounder and more valuable training if these same large classes were given fewer experiments, but were required to get at the significance of those actually performed?

One of the most important functions of the laboratory is to supplement the work of the class-room and to illus-



Standardizing Laboratory

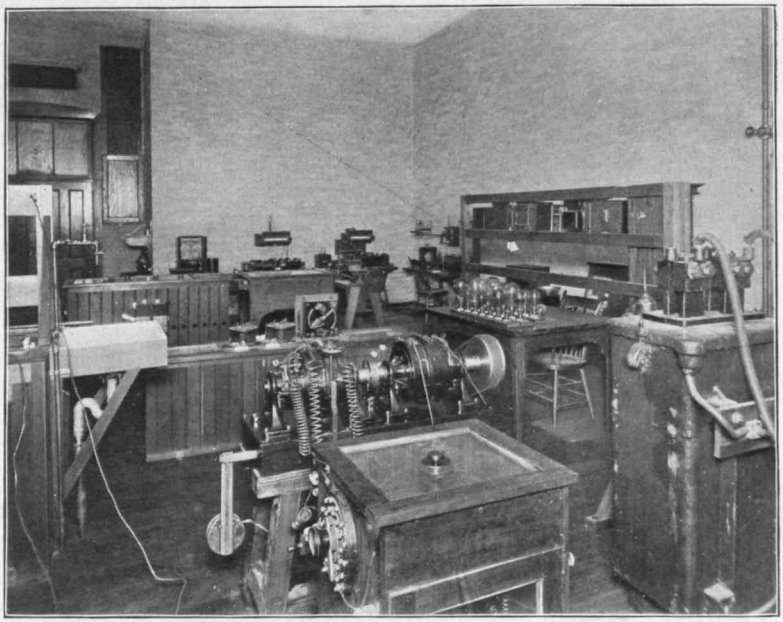


480 Kilowatt Double-current Generator, direct-connected to Cross-compound Engine

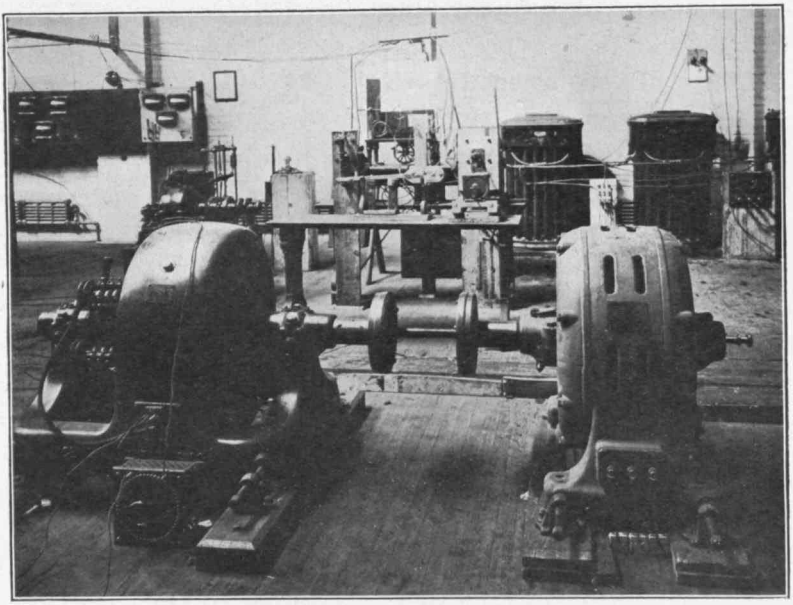
trate and emphasize the broad application of those theoretical principles which are the fundamentals in the education of any engineer. How often do we hear the laboratory work spoken of as "practical," indicating presumably that what is done with one's hands is practice, theory being reserved in its application to the use of the intellect! But the best practice and the best theory must ever be identical, only theory must precede practice. In planning, then, the work in the laboratory of electrical engineering, there should be kept constantly in mind the necessity for the most intimate relationship of this to the instruction in theoretical electricity. Certain of the experiments may well be laid out to illustrate certain points of theory which have been discussed in the class-room; and in connection with each laboratory experiment there should be certain questions proposed for discussion, which will require some analysis on the part of the student and the application of fundamental principles.

Preparatory to any piece of technical work should be a careful study of the methods of measurement to be adopted, the apparatus to be used, its limitations or special adaptability to the particular problem under consideration. This is equally true when a laboratory investigation is to be conducted, and the facilities for carrying on such preliminary study are furnished in the Department of Electrical Engineering at the Massachusetts Institute of Technology by the Standardizing Laboratory.

Here are provided direct and alternating current, the latter at frequencies of both 25 and 60 cycles, together with standard ammeters, voltmeters, and a potentiometer reading to 1,500 volts. For direct current work, currents of 1,000 amperes and potentials of 3,000 volts are available, and for alternating current work currents of 4,000 amperes



Standardizing Laboratory



Three-phase Induction Motor arranged for Thesis Work

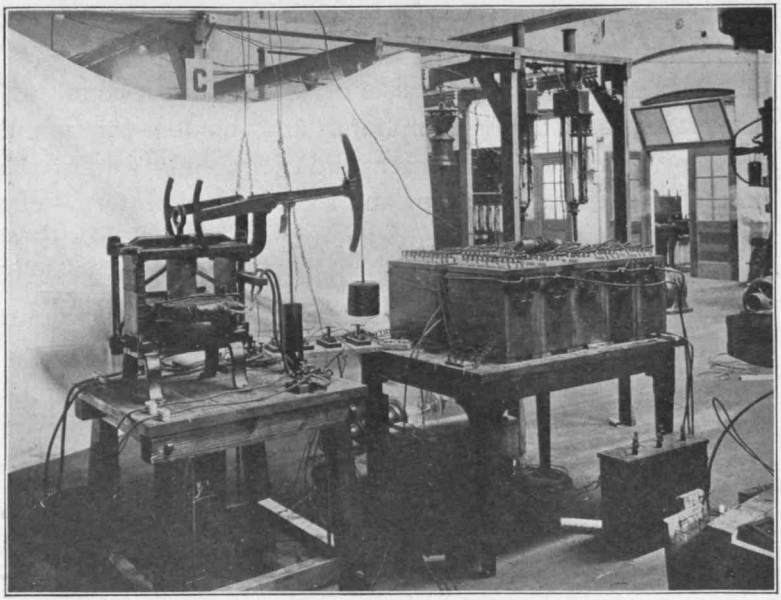
and potentials of 50,000 volts. Not only are currents and potentials of these magnitudes available, but also the necessary auxiliary apparatus for controlling and measuring them. Oscillographs of the Duddell type enable the determination of wave form to be made, a very important factor in many lines of investigation. The laboratory is also provided with sets of standard resistances, certified by the Reichsanstalt, with standards of inductance and capacity and with the necessary apparatus for their use.

For studying the various types of wattmeter two small generators are provided, and are so arranged that the particular instrument under investigation may be tested with varying power factor. The laboratory possesses a number of potential and current transformers which have already proved extremely useful in the study of certain high voltage power transmission problems. Some of the more important pieces of measuring apparatus have been designed in the department, notably some forms of sensitive galvanometer, recording instruments, and a wave-tracing device.

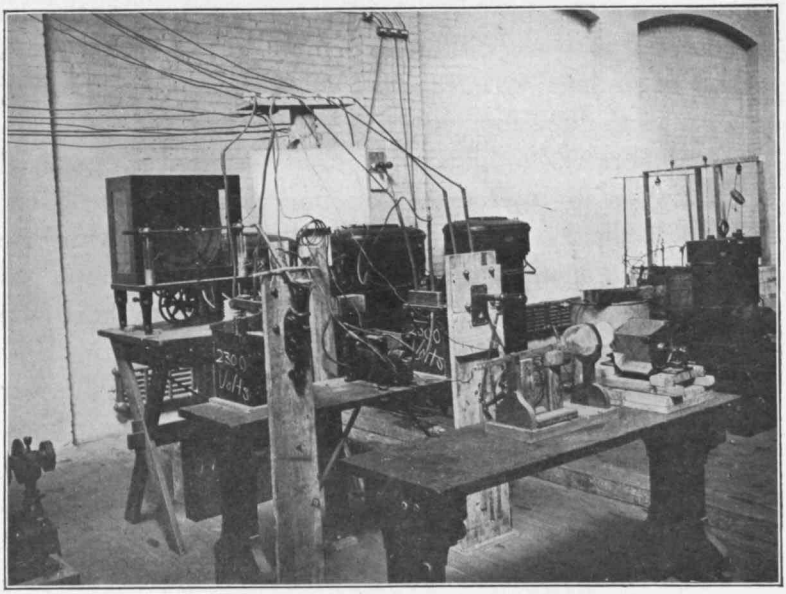
Now that thesis work is so frequently carried on at a distance from the Institute, a careful preliminary study of the methods and apparatus to be used becomes even more important than where the work is carried out in the laboratories of the Institute itself.

In connection with the regular instruction in the Standardizing Laboratory there is a system of conferences in which general methods of measurement for technical work are discussed, and questions of precision of results and economy of time specially emphasized.

The equipment of the Laboratory of Dynamo-electric Machinery includes, in addition to a considerable variety of direct and alternating current apparatus, a complete lighting and power plant used to supply the various Institute



Constant Current Transformer



Thesis Investigation or Oil Switches

buildings. This plant consists of boilers, direct-connected generators, both cross-compound and tandem-compound engines, a surface condenser and a cooling tower, the necessary circulating pumps and a feed-water heater. The output of the generators is delivered to a switch-board of modern type, and may be distributed to the buildings of the Institute or delivered to the mains running throughout the laboratory.

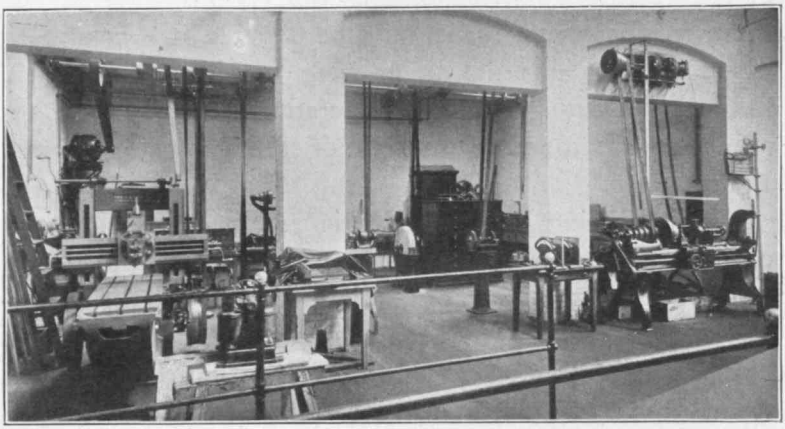
Not only does this permit tests of efficiency for the various units, both mechanical and electrical, when run under various conditions, but also enables the student to determine the actual cost of generation of electric power, from coal pile to switch-board,— a very important factor in the engineering of to-day. Tests of the plant are being carried on this present year, the departments of Mechanical and Electrical Engineering co-operating; and the results are to be discussed in general conferences, from both the mechanical and electrical standpoints. This gives both classes of students an adequate idea of current engineering practice in the development of electric power.

The laboratory equipment has been selected with special reference to its usefulness for purposes of instruction. Although there are of necessity in connection with the power work many large machines, yet the attempt has been made and will in the future be made to keep the laboratory units small, since in this way, and in this way only, can, with a given expenditure of money, a large number of different types of apparatus be obtained and a great body of students, who come simultaneously into the laboratory at a given time in the year's work, be successfully handled. Of course, it is essential that the size of the units shall be such as to illustrate the working characteristics of the particular type in question.

The instruction is planned to give the student at first an idea of the principles of operation of each type of machine as a unit, its efficiency, regulation, and general characteristics being studied. After this has been accomplished, the various machines are combined in a more or less complicated system, illustrating some of the broad principles of engineering operation. The student thus gets a much clearer idea of the relations existing among the various parts of the commercial systems than would be possible in a laboratory where individual units alone were considered. In fact, flexibility in arrangement and operation of the apparatus is one of the important features of the Augustus Lowell Laboratories.

There is being constructed this year in connection with thesis investigation an artificial transmission line, which later will be used in the work of regular instruction in the laboratory. After tests have been made on individual types of polyphase generators, synchronous and induction motors, these will be combined with the transmission line to illustrate some of the principles of high voltage power transmission, such as the relation of motor capacity to line constants, the effect of line unbalancing on current and voltage relations, the influence on transmission of varying the capacity and inductance of the line. A question of some importance which can also be investigated is the effect in an artificial line of the position occupied by the capacity and inductance. All such group experiments as these tend to broaden the point of view of the student,— an extremely desirable result in any system of instruction. It is important to emphasize that the work is in no sense intended to supply practical experience, since this cannot be given in any technical school, but must come after graduation. Too often are the experiments in engineering laboratories planned

as a sort of mimic of actual engineering, and accomplish about as much in the way of instruction as the tank dramas do in elevating the stage. The laboratory must confine itself to the illustration of the fundamental principles of engineering and to giving the student confidence and a sense of responsibility in handling any problem, to emphazing the importance of systematization of work, and to



Shop of the Electrical Engineering Department

cultivating powers of accurate observation. This work also is supplemented by conferences in which the general bearing of the experiments upon current engineering practice is discussed.

Each student, previous to beginning any particular piece of work, is required to present a statement of its object, the method by which it is to be attacked, the apparatus required, and the instruments necessary, together with a detailed sketch of the arrangement of circuits for properly carrying out the investigation. This is commented upon by the instructing staff in consultation with the student; and since the introduction of this plan there has certainly

been a great gain in independence of action in the laboratory, less supervision being required than formerly. The student is obliged to get the apparatus in shape for his work, connect up his circuits, and, briefly, to do the thing himself rather than to make constant appeals for assistance to members of the instructing staff. In arranging and shifting the apparatus, the 10-ton electrically driven crane, travelling as it does the length of the laboratory, is of the very greatest assistance. The shop of the department, which is well equipped, enables the various small pieces of apparatus, which are required in the ordinary laboratory work or from time to time in thesis work, to be constructed, frequently by the students themselves, which tends to give them self-reliance.

For work in direct currents there are various generators for arc and incandescent lighting, and a large number of motors of different types. Many of the motors are of less than 10 horse-power capacity, and one of 150 horse-power capacity is at present used for supplying power to the testing-floor. This testing-floor is 12×30 feet in area, is drained, of fireproof construction, and is laid with rails to which the apparatus under test may be bolted. It is also supplied with power from a 100 horse-power standard engine.

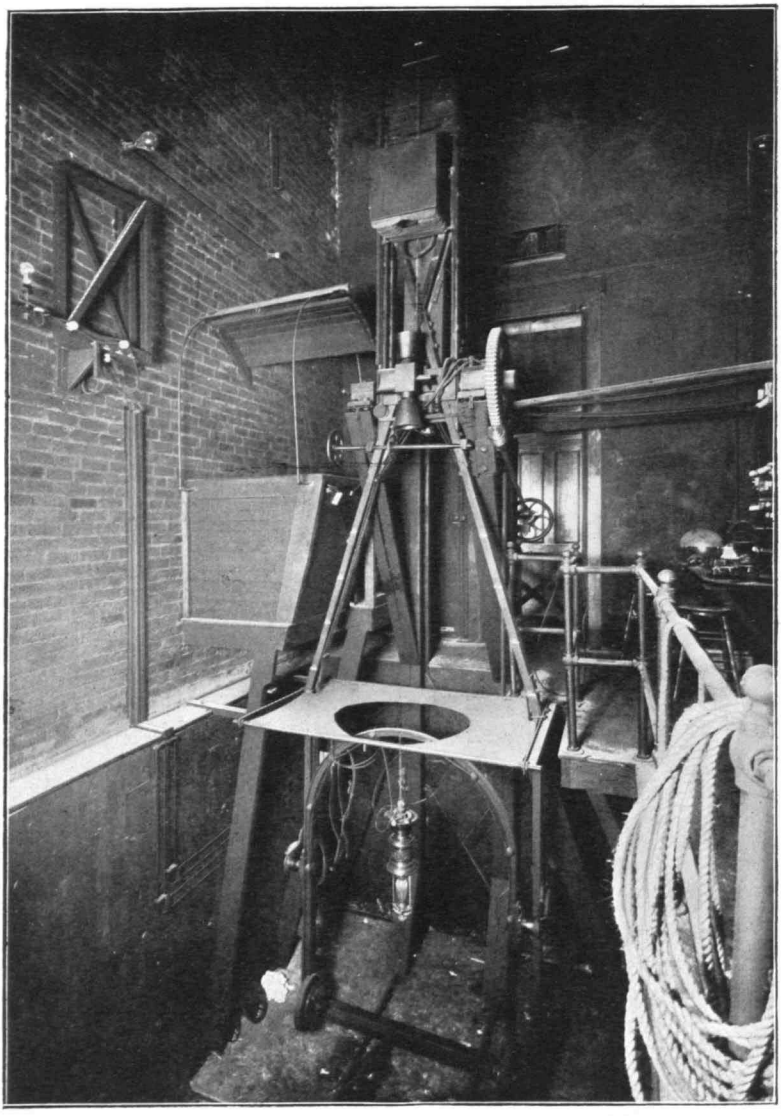
For parallel running there are two similar 25 kilowatt generators belted to a 100 horse-power compound engine. This set, fitted with engine-indicating apparatus and surface condenser, and having its special switchboard and electrical instruments, is also used for instruction in methods of plant-testing. The ventilating fans of the building and the fan for the cooling tower are electrically driven, and available for purposes of instruction.

The alternating current apparatus forms a most com-

plete equipment, both in variety and in range of output. There are both single and polyphase generators, one a double current machine, of 480 kilowatts capacity, with six-phase connection on the alternating side. There is also a 150 kilowatt quarter-phase generator with Scott transformers, for use in connection with transmission of power through cables to the other buildings of the Institute. The transformers include many of various makes and capacities, —a 55 kilowatt three-phase type, a constant current transformer, and in conjunction with an experimental three-phase generator are Scott transformers of 10 kilowatts capacity. One of the most interesting machines in the laboratory is a 2 kilowatt generator to give any frequency up to 10,000 cycles, thus allowing the behavior of inductance and capacity under high frequencies to be examined A pair of testing transformers wound for 100,000 volts enables puncture and insulation tests to be carried out on the various materials which are in use to-day in connection with high voltage power transmission.

A 50 kilowatt, 25 cycle rotary transformer, with compounded field windings, a variable reactance, and starting compensator, can be used for the study of the rotary converter as adapted for railway or lighting service. There are also two 15 kilowatt, 60 cycle, three-phase machines, which may be operated at any frequency between 25 and 75 cycles, and can be used as generators for parallel running or as generator and synchronous motor. Induction motors, both single and polyphase, with armatures of different types, are available for study either singly or connected in tandem for illustrating methods of control in alternating current railway work.

There are rooms for both incandescent and arc light photometry, the work on high candle-power lamps being carried



Photometer for Lights of High Candle-power

on with a photometer designed and constructed in the department. These rooms are provided with various photometers and standards of light. The instruction in this subject includes not only practice in the methods for determining the illuminating power of various light sources, but also investigations of various questions, physiological or otherwise, whose influence affects the value of photometric work.

The Electrical Engineering Laboratories are also called upon to furnish opportunities for instruction to a considerable number of non-electrical engineers, who will later be called upon to decide certain electrical problems in the selection and operation of electrical machinery. While these students do not need the thorough grounding which is essential to the success of the students in electrical engineering, yet it is extremely desirable that they should have sufficient knowledge to bring about the most satisfactory result in any given case. The laboratory work brings out the matter from the operating standpoint, which is that with which many of this class of men will be most directly concerned.

Throughout the laboratory instruction the importance of investigation and research, of contributing to the great fund of technical knowledge, is strongly urged; and for such work the facilities in the Augustus Lowell Laboratories are unusual. The influence upon undergraduate work of a small body of men carrying on original investigation cannot be overestimated in its effect as an inspiration and as tending to give the student that genuine love for his work which must always exist for the man who is to become really great in any profession.

H. E. Clifford, '86.

THE COURSE IN GENERAL STUDIES

One of the most important matters now under consideration by the Corporation and Faculty of the Institute is the continuance of the Course in General Studies; for there is involved in it the large educational question of the proper attitude of technological schools towards general education and towards courses of instruction leading to a business career. It is the purpose of this article to present briefly to the readers of the REVIEW a history of the General Course at the Institute, the recent actions of the Executive Committee and of the Faculty in regard to it, and the arguments for and against its continuance. The historical portion of this article is based largely on a full report recently made to the Faculty by a special committee, from which extensive quotations will be made.

A course in General Studies was one of those contemplated by the founders of the Institute. In the first catalogue issued it is stated that one of the objects of the lSchool of Industrial Science of the Massachusetts Institute of Technology is "to furnish such general education, founded upon mathematical, physical, and natural sciences, English and other modern languages, and mental and political science, as shall form a fitting preparation for any of the departments of active life."

In accordance with this plan, at the opening of the Institute there was established, in addition to five strictly professional courses, a sixth course entitled General Science and Literature. The third and fourth years of this course were devoted to instruction in language, history, political economy, the science of government, philosophy, logic, rhetoric,

English literature, advanced physics and chemistry, astronomy, geology, zoölogy, paleontology, physiology, anatomy, and botany.

This course was maintained with some minor modifications till 1873, when it was differentiated into four separate courses entitled Natural History, Physics, Science and Literature, and Philosophy, each of these offering "a sound education as well as suitable preparation for any of the departments of practical life." Into these general courses were introduced the new subjects of history of commerce and industry, political and industrial geography, and business law.

In 1878, when President Rogers again became head of the Institute, the Course in Philosophy was replaced by a so-called "Elective Course" in physical and natural science, while that in Science and Literature retained its more general character. According to the report of President Rogers, these courses embodied a "larger element of literary and industrial study than the strictly technical courses, and are especially intended to furnish a liberal preparation for business pursuits."

In 1881, when General Walker became President, the Course in Science and Literature and the Elective Course were combined as Course IX., under the title of "General Course," which offered three options (in Physics, in Chemistry, and in Geology) with the following explanation: "In addition to the strictly professional courses certain general courses have been established for such as may not intend to adopt a distinct profession, yet desire to obtain an education through studies of a scientific character. These courses are especially recommended in the case of young men whose purpose it is to become merchants, manufacturers, or bankers, who desire a preparation for active life which shall

be liberalizing in its tendencies, but without any influence to alienate them from the ideas, tastes, and habits which are appropriate to practical business pursuits."

In 1884 the three formal options were abolished, but freedom of choice among a variety of subjects in the last three years of the course accomplished the same end.

It was during President Walker's administration that the General Course assumed its present form and received its greatest development, the President having a deep personal interest in the welfare of the course, and, in fact, taking an active part in the instruction in political economy. To the appointment of Professor Dewey in 1886 was also due in large measure the subsequent success of the course. The instructing corps was afterwards further strengthened and new facilities provided which made it possible to accomplish more work of a higher standard than ever before.

Some quotations from President Walker's reports will serve to indicate the prosperity of the course and his high appreciation of its value. In 1883 he said: "More than a year ago the Faculty, with the approval of the Corporation, established the three general courses, . . . recommending them in the case of young men whose purpose it is to become merchants, manufacturers, or bankers. The period which has since elapsed has not been sufficient to test the suitableness of the courses then projected to meet the demands of the community; but, with the improved facilities of instruction at the command of the Institute, I cannot doubt that the opportunities offered for an education which shall combine both practical and liberal tendencies will be made use of in a rapidly increasing degree." In fact, in 1887 the number of regular students in the three higher years of the course rose to fourteen, and in 1891 to nineteen, and then remained nearly constant for four years, the

average number for the fifteen years from 1887 to 1901 being 13.3.

In 1887 it is stated by the President that "the General Course has been further extended and improved during the year to enable it to perform that part in the work of the Institute which has been assigned to it by the Faculty. A considerable number (11) of the students of the second year have entered the course, thus showing their appreciation of the advantages offered upon this side of the school." In 1890 he writes encouragingly of the "general prosperity that has attended the course during the last year."

President Walker's report of 1894–95 contains the following paragraph: "Demands for accommodations for the special use of the General Course have been constantly increasing, until this summer it became necessary to fit up Room 44 adjoining the present library as a study-room. The growing interest in the course is evidenced by the recent organization of a society composed of students and instructors especially related to the course, whose object is to promote its intellectual and social interests. . . . It is much to be desired that the financial condition of the Institute were such as to allow a larger appropriation for the purchase of historical books, and also maps, diagrams, and other illustrative material."

The last report of President Walker's is also full of hope for the course, and points out still further progress and improvement.

From this historical summary it is clear that a course in general studies suitable as preparation for a non-professional business career was contemplated by the founders of the Institute, and that until very recently a course of this kind has been consistently maintained and steadily developed. The desirability of continuing such a general course at the

Institute seems first to have been seriously questioned in 1899 in connection with a report by the committee of the Corporation on the Departments of Literature, History, and Political Economy. In this report especial emphasis was laid upon the small number of students which the course has attracted, this being regarded, in view of the indefinitely large demand for educated men in business careers, as an indication that "the course is not adapted to the object in view and has not fulfilled its mission." The purpose of the report seems, however, to have been only to invite a further study of the question; for it states that the committee is not prepared to make any recommendation either as to a modification of the course or as to the desirability of continuing it in its present or in a modified form.

As a result of subsequent consideration of the matter by the Executive Committee, it was voted by that body, according to the President's report of 1902, "to discontinue the Course in General Studies, at least in the form in which it is now offered"; and in explanation of this decision it is stated that "the course was intended to appeal from its nature to a large number of men, being a general rather than a technical course. This has not followed; and, while the work of the course itself and the training which the students receive in it have commanded the highest approval, the course has during its existence appealed to but a small number."

The Faculty was then requested by the Executive Committee to consider the advisability of establishing at the Institute a general and somewhat elective course in physical and natural science. This matter was fully investigated by a committee of the Faculty, which reported adversely upon it, for the following reasons: The Institute already offers

four courses leading to a degree, which are not of a strictly technical character — namely, in pure chemistry, physics, biology, and geology,— from any one of which a student obtains a broad and thorough training in science and acquires a large knowledge of many subjects apart from those with which the course is most immediately concerned. Moreover, these courses are elastic enough to meet any special needs of particular individuals. Furthermore, serious difficulties were found to exist in laying out the work for the later years of a general scientific course, owing to the students' lack of preparation for the advanced instruction in the various departments of the Institute. It was, too, the opinion of the committee that such a course would be necessarily of a somewhat heterogeneous character, and would not furnish the student with the best training either for any particular profession or for business.

A new committee was then appointed by the Faculty to consider and report upon the broader question, whether it is desirable for the Institute to maintain a non-professional course of any kind; and, if so, what its character should be,— whether the Course in General Studies should be retained in substantially its present form or whether it should be so modified as to prepare more definitely for specific ends, such as general administration, industrial management, commerce, or finance. It is the report of this committee to which reference was made at the beginning of this article. The conclusions reached by the committee are, that from the educational point of view it is desirable to have a course in general studies at the Institute; that it is desirable to modify the present general course so as to adapt it more specifically for training in business management; that it should be given a new name, such as "Course in Industrial Management," which will indicate that it is

intended to afford preparation for an administrative career; and that an endeavor should be made to attract to it strong students desiring to fit themselves for administrative positions.

After thorough discussion of this report the Faculty reached the conclusion that, in order to maintain a high standard of instruction in general studies for the main body of Institute students, and in order to make that instruction as effective as possible, it is of great importance that a general course of some kind be continued, and that, pending the decision of this broad educational question, it is premature to consider modifications of the curriculum in this or that direction, whereby the important question at issue might well be obscured. Accordingly, the Faculty adopted by a large majority a resolution to this effect, which, together with a statement of the reasons therefor, is to be submitted to the Corporation.

The specific arguments which have been adduced for and against the continuance of a course in general studies at the Institute will also be of interest to the readers of the Review.

The arguments *against* the course seem to be mainly the following ones: —

(1) That the small number of students which it has attracted is an evidence that it does not meet an educational want in the community.

(2) That any general course is an attempt to provide a non-professional education, and that this is the legitimate field of a college rather than of a technological school.

(3) That for a young man desiring to prepare himself for a business career, it is really more advantageous for him to attend college than to take a general course at the Institute, by reason of the more liberalizing atmosphere and the greater opportunities for social life that prevail at the former class of institutions.

(4) That a general course at a technological school is likely to be a weak course, and to become merely a refuge for students who have not the mathematical or scientific ability to pursue the engineering courses, thereby discrediting it in the eyes of students and instructors.

(5) That the attempt of the Institute to maintain a course so distinct from its engineering and scientific courses involves disproportionate effort and expense, and diminishes the resources available for its professional work.

In regard to the first of these arguments it may be said: first, that from 1891 to 1898, when the course was receiving the active support of President Walker and the authorities of the Institute, it had in its three higher years nineteen regular students, being 4 per cent. of all such students at the Institute and a number as large as or larger than that then taking five of the other Institute courses; secondly, that the existence, and especially the character and aim, of the Course in General Studies is not generally appreciated by the public, because, although especial effort would be required to bring it to the attention of the community, owing to the fact that it is a line of work distinct from the well-known professional courses of the Institute, yet it has actually received less advertisement and indorsement than most of the other Institute courses; and, thirdly, that, in so far as the course stands for the new principle that an education for administrative positions connected with manufacturing, transportation, and trade should be based primarily on scientific knowledge and a training in scientific methods rather than on literary, historical, and classical study, it may well be expected that much time and effort will be necessary to secure the recognition of this educational reform, just as it was of the general educational methods for which the Institute stands.

In reply to the second argument, that the Institute is engrossing the function of a college in maintaining a non-professional course, in the first place, it may be contended that, having a character intermediate between that of a college and of a graduate professional school, the Institute is differentiated from either of these far more by its system of education than by the particular branches of study to which it has applied that system, and that there is hardly a greater difference between the curriculum of a rational scientific course leading to a business career (as exemplified, no doubt somewhat imperfectly, in the present Course of General Studies) and those of the other Institute courses, than there is among the latter themselves. To see this, one needs only to consider the widely different kinds of knowledge and of training that are given to the mechanical or electrical engineer, the architect or landscape gardener, the chemist or physicist, and the biologist or geologist. That, on the contrary, the system of education prevailing at the Institute differs in important respects from that at colleges will be readily conceded: mention need only be made of its prescribed courses of study; of the emphasis laid on scientific study, as shown by the requirement that all students complete substantial courses in elementary mathematics, chemistry, and physics; of the large proportion of time devoted to practice in the laboratory, drawing-room, and work-shop; of the constant applications of the knowledge acquired to industrial problems; of the requirement from every candidate for the degree of the execution of an original investigation or of a new design; of the general plan of working at high pressure; and, finally, of the characteristic intellectual and moral influences resulting from its methods. It should therefore be the aim of the Institute to extend its system, as far as its resources permit, to

new fields in which there is good promise of its success, and it should refuse to allow its activity to be limited by the arbitrary assertion that it is assuming the functions of other kinds of institutions. In the second place, entirely aside from any desire to extend its work in the direction just referred to, there are strong and perhaps entirely sufficient reasons why the Institute should maintain a so-called general course in order to enable it to make better provision for the general education of the main body of its students, and for the special instruction of those students who come to it because of their appreciation of its methods and its influence in forming character, and yet are not desirous or are ill-fitted to pursue its courses in engineering and natural or physical science.

The third argument, that a college course is a better preparation for a business life, is one that does not admit of a sweeping answer. The advice in this respect to be given to a young man should properly depend, in a measure, on his character, his aptitudes, and social and financial position. The more broadening influence of the college atmosphere and the greater opportunities it affords for social life and good fellowship are not to be lightly estimated. But, on the other hand, the spirit of earnestness, accuracy, responsibility, and hard work, which prevails in a professional school, is often of even greater importance. Whatever may be the relative advantages of these different atmospheres,— and this depends much on the character of the student that is to be subjected to them,— there would seem to be little doubt that scientific knowledge and training are far more advantageous to the modern business man than a knowledge of literature, history, the classical languages, and art. It is true, that a student can get at college, under the elective system, almost any scientific

subject he wants, and especially that there is offered to him in much larger variety than at the Institute courses in economics, sociology, law, and other similar sciences of importance in a business education. But he will get at the Institute in its general course all the more important of those subjects in a form more specifically adapted to his ends, and presented equally well provided the efficiency of its general instruction is maintained; and, therefore, the discussion again resolves itself into a consideration of the question which system of education offers the greater advantages in general and in any individual case. Moreover, the fact must not be ignored that, aside from the real merits of this question, many parents and many boys have a decided preference for an education at the one or the other kind of institution, and that to limit the present freedom of choice would result in shutting out certain boys altogether from a higher education.

The argument that a general course at a technological school is merely a haven of refuge for incompetent students has been answered by citing the experience of the Course in General Studies at the Institute. The records show that, although to some extent poor students temporarily drop into it from other courses in which they have not been able to succeed, yet only those who have ability and industry as high as that of the average student in other courses complete the work and receive the degree. In most of the other courses mathematical ability is one of the main conditions of success as a student; and the committee contends that this is not the most important quality in applied science or even in engineering, and that a man may be as logical a thinker and as clear an observer without much mathematical ability as with it. The committee states, too, that examination of the records made since grad-

uation by the graduates of the course in general studies shows that, as a rule, they have succeeded quite as well as the graduates of other courses. Moreover, a large proportion of the students who complete the general course come to the Institute with the intention of taking it, or decide to do so in the first term of the first year. Thus there were six applicants for the course in the first-year class of last year.

The argument that the maintenance of a general course at the Institute involves unwarranted expense is met by the reply that, since the Institute must maintain a high standard of instruction in general studies for the sake of the main body of its students, the additional expense is relatively small, and that this would be more than met by the tuition-fees of the students in the general course, provided this were brought to the attention of the public as fully as is done in the case of other courses.

The arguments *for* the continuance of the Course in General Studies have been in part already referred to in the discussion of the objections to the course. These arguments may be here recapitulated in more definite form, and a number of additional ones presented. They are as follows: —

(1) That it is desirable, at least in many cases, that a scientific rather than a literary training should form the basis of an education for administrative positions, and that the Institute can appropriately offer such a training along the lines of its professional courses, and thus extend the advantages of its educational system to an important class of students.

(2) That the moral character, the earnestness of purpose, the devotion to work, and the appreciation of scientific knowledge and methods which the Institute develops in its students are advantages no less to business men than to

those engaged in engineering professions, and that many young men who have no inclination or special aptitude for mathematical or physical science would nevertheless, through their own preferences or those of their parents, seek an education under the influences prevailing at the Institute.

(3) That the maintenance of a general course assists materially in securing a more liberal education of the main body of the students, primarily by enabling the Institute to secure and retain the services of thoroughly competent instructors in general studies whose contact with students and influence with the Faculty itself cannot fail to be of great service in this direction; and, secondarily, by emphasizing to the students the importance of such studies from a professional standpoint, by offering them advanced elective courses of that character, and by the liberalizing influence coming from the participation of students pursuing a general course in the class life, social life, and outside interests of the students at large.

(4) That a general course provides for the educational needs of students having ability in that direction who come to the Institute with the mistaken intention of taking a strictly professional course, but find during the first or second year that they have not the requisite mathematical aptitude or technical skill; and that it is very desirable to provide for such students, in order to obviate the serious disappointment and hardship involved in making a fresh start at another institution.

(5) That a discontinuance of the Course in General Studies involves a departure from a policy expressly advocated by the founders of the Institute, and consistently maintained before the public by its Presidents and in its publications for nearly forty years; and that it will be

interpreted by the public at large, whether rightly or wrongly, as an indication that the Institute will hereafter take less interest in the breadth of the education of its students; and that it will offend a large body of graduates from the general course who have testified almost unanimously to the great value which they derived from it, and have protested earnestly against its discontinuance.

With reference to the first argument, that it is desirable to offer a scientific course leading to an administrative career, it may be contended that several of the engineering courses at the Institute already do this in a fairly satisfactory manner, and that a graduate in almost any of them is better fitted for a responsible position in connection with manufacturing or transportation interests than the average college graduate. This may be admitted; but it does not meet the objections, first, that there are many capable students who are not so mentally constituted as to enable them to pursue with advantage a specialized course involving much mathematical ability and manipulative skill; and, second, that for any one not intending to follow a definite profession it is far more profitable to replace many of the detailed and purely technical subjects of the engineering courses by thorough instruction in sociology, economics, industrial and financial history, business law and practice, and administrative methods, and to increase the proportion of the general literary, historical, and philosophical studies.

Against the second argument, emphasizing the salutary influence of the ideals and spirit prevailing at the Institute, it may be contended that the college atmosphere offers on a different side equal or greater benefits. This matter in its general aspect has been already considered; and the probability that the correct decision as to the relative advantage of the two influences will vary with the character

of the student has been alluded to. It may, however, be further pointed out that, even though it be admitted that the professional courses of the Institute are unavoidably somewhat narrow, yet this does not apply with much force to its Course in General Studies, where the less technical requirements of an administrative training leave far more time for general education, and where a comparatively small number of students are in close contact with instructors whose main interests lie in that direction.

The force of the argument that the existence of a general course will enable the Institute to secure and retain an abler staff of men to give instruction in general studies, since, otherwise, their work in teaching only elementary subjects would be a dull routine, is perhaps best shown by the great weight given to it by the Faculty itself in its discussion, several of the members of which considered this to be the most important reason of all for the retention of the course. Against the claim that the students of the general course will have a broadening influence on the whole body of students, it is urged that the effect of such a small number, say forty or fifty in all, can be but slight on a mass of fifteen hundred students. It must not be forgotten, however, that they form a natural centre for the origination, development, and support among the students of those general interests which President Pritchett is so earnestly desirous to promote. This was well exemplified by the establishment of the Walker Club some years ago by the students of the Course in General Studies. And there is little doubt that this influence would become more powerful if the course were strengthened by a moderate increase in the number of its students and by a more active support on every side.

In conclusion, it seems desirable to sum up, without at-

tempting to weigh the differing arguments, the disadvantages that may possibly result or are sure to follow both from the continuance and the discontinuance of the general course. The possible disadvantages from its continuance seem to consist, at the worst, only in a small pecuniary sacrifice, and in a disregard of the contention that the Institute is exceeding its proper functions in offering courses for a general education or as a preparation for administrative positions. From its discontinuance, on the other hand, must result a failure to provide for those students who, after coming to the Institute, find they lack aptitude for the professional courses; it must also result in the omission from the subjects of instruction offered at the Institute, and open as electives to all its students, of the advanced courses in composition, literature, history, philosophy, economics, finance, sociology, and law. It may result, furthermore, to a greater or less extent, in the lowering of the efficiency of the instruction in general studies given to all students, and of their interest in non-scientific matters, through increased difficulty in retaining the ablest instructors, through removal from the student body of the students devoted mainly to such work, and through a lessened interest in general studies on the part of Corporation, Faculty, and students, due to a more complete withdrawal of these from their attention. It may also have the effect of leading the public to believe that the Institute work is becoming more highly specialized at the expense of the general education of its students. Finally, by the discontinuance of the course the Institute relinquishes the opportunity of extending its educational system into the apparently promising though yet undeveloped field which is opened up by the need for men trained along broad scientific lines for business and administrative positions.

ARTHUR A. NOYES, '86.

THE JUNE ALUMNI REUNION

Devotion to education in our American institutions means too often devotion to a single educational enterprise or a particular institution, without the broader sympathy which ought to go to the general problems of education. Nevertheless, the element of personal loyalty and, more than all, of personal affection to one's Alma Mater is one which cannot be left out of a man's education without serious loss. Just as one's affections for his family differ from his philanthropic interest in the human race, so may his feeling for his Alma Mater differ from his general interest in all learning and in all efforts to advance it.

The plan which has been suggested, of bringing together the various classes for reunion during Commencement Week, would seem to be one adapted most admirably to strengthen this spirit of affection and to promote a wider fellowship between members of the different classes. Further, by making special efforts for these reunions at intervals of about five years, we may well hope to celebrate different epochs of the Institute's history and its growth.

For this reason the plan of having such a general reunion next June commends itself to me as a movement in the interest of both loyalty and fellowship. Those who have to do with the administration of the Institute will welcome and will do all in their power to further the efforts which the various classes may put forth to make next June's gathering an epoch-making one.

HENRY S. PRITCHETT.

THE OBSERVANCE OF COMMENCEMENT BY THE ALUMNI

Technology lacks one feature usually found in college life; that is, the active participation of its alumni in commencement. This is due not to indifference on the part of the graduates, nor to the busy lives they lead, but rather to a lack of definite opportunities and reasons for gathering. If these are offered, the alumni will come. At least, this conclusion may be drawn from some experiments made at the 1903 commencement. Two classes, '93 and '98, held class celebrations at that time; and, while the programmes of the two differed somewhat, in that the former included in its celebration a field day on the North Shore, they agreed in many features, and in a number of ways these classes co-operated to make each other's celebration a success. Both maintained headquarters and held class reunions on the afternoon of commencement day, both held annual dinners at about that time, and both participated commencement evening in the "Tech Night Pop Concert."

The headquarters of '93 were at Hotel Brunswick, and those of '98 in one of the rooms of the Technology Club. In each, men from widely scattered places gathered in the early afternoon, it being for many of them the first "homecoming" since they had gone forth from their Alma Mater some years before. While '98 was attending, in a body, the graduating exercises of the class of 1903 and listening to the learned theses, '93 improved the opportunity to make a systematic inspection of the Institute buildings and see the changes that ten years had wrought. For '93

and '98 the afternoon was brought to a close by a most cordial interchange of visits to each other's headquarters, and at the class spreads new acquaintances were made and friendships formed which, it is hoped, will be strengthened year by year; for these two classes, at least, propose to visit each other every commencement day.

'98 held its annual class dinner on Monday, the eve of commencement, while '93, and '85 also, held theirs in the early evening of Tuesday, commencement day. The two latter dined at the same hour at the same hotel, the Brunswick; and pleasant greetings were exchanged between them. By good fortune, President Pritchett was able to be present, for a time at least, at each of the three dinners.

For some years, as the alumni generally know, it has been the custom for the graduating class to close its festivities by attending the Pop Concert in Symphony Hall on the evening of commencement. Gradually, the attendance of the alumni has increased until "Tech Night at the Pops" has become an established custom. This last year '85 and '93 ended their dinners before nine o'clock; and together with '98 and many other classes they attended the Pop Concert, each as a body, '93 having the honor of escorting the President to the hall.

The idea of a class celebration at the 1903 commencement had been carefully considered by the class of '93 for more than two years. The success of last year's reunion has led that class to make to the Association of Class Secretaries these propositions: —

First. That annually each class maintain a class headquarters at or near the Institute on the afternoon of commencement day.

Second. That, so far as practicable, annual class dinners be held at about the time of commencement.

While the propositions of the class of '93 are made with the idea of having the alumni come to commencement every year, a movement is already well under way for an event which may mark the beginning of this custom : namely, a great alumni gathering at commencement next June. In the matter of this reunion the Northwestern Association has taken the initiative, and is at work to interest other local alumni societies and to secure reduced railroad fares with a view of getting out men from all over the country. In Boston the active work necessary to carry out the proposition has been undertaken by a committee of the Association of Class Secretaries.

Although the programme for this year's gathering has not been finally decided upon, it can be outlined in a general way. It is proposed to have the celebration cover three days: Monday, Tuesday, and Wednesday, the 6th, 7th, and 8th of June. Briefly, the programme includes trolley trips about Boston, class dinners, and a reception to the graduating class on Monday; class and fraternity reunions and spreads, inspection of the Institute buildings, other class dinners, and "Tech Night at the Pops" for Tuesday; and on Wednesday a daylight excursion by steamer down the harbor and along the North Shore, to be followed by a shore dinner at one of the beaches. On one or more of these days the alumni and the ladies with them will have an opportunity to meet the President of the Institute.

Ladies will be especially welcome at this reunion, and it is hoped that they will attend with the alumni in large numbers. Although they may not be present at all graduate functions, there are a number of the latter, such as the trolley trips, the Pop Concert, and the events of Wednesday, that will interest them particularly. And they may be assured that,

when the men choose to flock by themselves, the ladies will by no means be forgotten, as receptions and other entertainments will be arranged in their honor.

Alumni from out of town will probably reach Boston Monday morning. On their arrival they will find a cordial welcome awaiting them at the general headquarters, where accommodations will be assigned, information given, and everything possible will be done for their welfare. When comfortably settled and refreshed from their journeys, they will wish to see something of Boston; and, to do this most expeditiously, trolley trips will be taken through the city and suburbs, the cars being accompanied by guides to explain points of interest. In this way a great deal of Boston can be seen in a short time, and to those returning after several years' absence the changes in the city will be many and interesting. The principal event for Monday evening will be the reception by the alumni to the graduating class. On this evening, too, several class dinners will probably be held, it being possible to have these dinners, for example, from six until nine, and still give the members an opportunity to attend the reception.

Tuesday, commencement, will be the chief day at the Institute. On this day it is proposed that the classes open headquarters at noon, at which they shall provide simple spreads. Classes small in numbers will probably unite for the occasion. Doubtless the fraternities will keep open house as well. Some of the spreads could be held in rooms of the Institute buildings; and the many hotels, halls, and studios in and about Copley Square are amply sufficient to provide for as many and as varied gatherings as it may be desired to hold. Although Huntington Hall is not large, very likely those alumni who care to do so will be afforded an opportunity to attend the gradu-

ating exercises. It is probable, however, that the afternoon will be given up to class and fraternity reunions, to visiting the different spreads, and to inspecting the Institute buildings in which the laboratories, drawing-rooms, and the students' work of the year are then on exhibition. To one returning after an absence even of only two or three years the changes and growth in the Institute are most marked.

It is likely that a majority of the classes will hold their dinners early Tuesday evening; and in this connection it is fortunate that the number of Back Bay hotels within easy distance of the Institute is so large that all the classes could hold dinners at the same time, if need be. Classes which had united for a common spread in the afternoon might dine together. These dinners may easily be finished in season to allow all classes to participate in "Tech Night at the Pops,"—a most pleasant ending of the day for the alumni as well as for the graduating class.

It is suggested that informal dress be worn at all commencement day functions, including the class dinners and the concert. This will enable men to come to their class reunions in the afternoon, and remain throughout the day's festivities without the inconvenience and delay incident to dressing for the evening. This plan has already been tried with success.

On Wednesday it is proposed to spend the entire day upon or beside salt water. A steamer will be chartered for the alumni's exclusive use; and, starting in the morning, a sail will be taken down Boston Harbor and along the North Shore, one of the most beautiful trips on our whole coast. Luncheon will be served on the steamer. Early in the afternoon the party will land probably at Nantasket Beach and make its headquarters at one of the large hotels.

Opportunity will then be offered for sea bathing and for other recreation until dinner-time. At this season but few summer guests will have arrived, and the alumni should have the hotel and the beach pretty much to themselves. The shore dinner Wednesday evening will be the final and crowning event of the celebration. The hotel will do its best to provide for the material wants of the party, speakers of national fame will be guests, and in every way the affair should be a memorable one in the annals of the Institute.

It is not proposed that the reunion of 1904 be repeated at each succeeding commencement. This year it is hoped to hold a celebration unprecedented for Technology, and it would be too much to expect such a large and general attendance of alumni oftener than perhaps once in five years. The programme outlined for Monday evening and for commencement day, however, could well be repeated every year, and at the last meeting of the Alumni Association it was even suggested that the date of the annual alumni dinner be changed to the time of commencement. These propositions for an annual commencement observance are what '93 would suggest; and, if carried out, it is believed they will result in the development among the alumni of a broader and stronger Institute spirit. The alumni organization must not become simply a collection of so many class units. The men should know each other better outside the limits of their classes, and class spreads afford an opportunity for wider acquaintance. The "Tech Night Pop Concert," too, with its Tech music and college songs, is of great value in bringing men of all classes together in one loyal and enthusiastic body. That the attendance of the alumni may be as large as possible, the suggestion of holding annual class dinners at this time is

made with a view of furnishing a greater attraction to draw men from a distance.

It is to be hoped that in every way this year's reunion will be a success, that every class will be well represented, and that the affair may mark the beginning of a new feature of Institute life,— the more general observance of commencement by the alumni.

FREDERIC HAROLD FAY, '93.

THE TREASURY DEPARTMENT *

The preceding articles upon "The Task of our Alumni in the Government Service" have dealt more especially with the work of the strictly scientific or technical bureaus or departments. These bureaus are in general organized by and operated under the immediate control and direction of men of the highest scientific attainments, and the work conducted by a competent staff and a trained *personnel* amid an environment which cannot fail to stimulate an active and earnest co-operation to secure most efficient results. Regardless of the exact nature of the duties to be performed, be they the construction of a battleship or a quest for a more intimate knowledge of the invisible forces of nature, the results achieved by the individual are the measure of his success and his opportunities for advancement. Moreover, the results to be accomplished by these scientific departments are matters of the greatest public interest and concern and worthy of the respect of the nation. They command an enthusiastic and patriotic service on the part of the technically trained employee. Under such favorable conditions government service is becoming increasingly attractive as the number of those who entertain the highest ideals of duty grows larger.

* For the earlier papers of this series contributed by the Washington Society of the Massachusetts Institute of Technology see TECHNOLOGY REVIEW, vol. iv. pp. 57, 195, 316 and 485, and vol. v. pp. 52 and 180.

But what shall be said of the work of those branches of the government which are not confined strictly either to pure science or to constructive engineering? The administration of a department like the Treasury, for instance, includes besides the control of the currency and other fiscal obligations for which it was primarily created, such divisions as the office of the Supervising Architect, Revenue Cutter Service, Life-saving Service, Mint Bureau, Marine Hospital Service, and Bureau of Engraving and Printing.

The work of the office of the Supervising Architect has been presented in a previous article, and an attempt will be made briefly to outline the nature of the duties of the remaining divisions and bureaus in so far as they involve the services of the engineer, using that term in its broadest sense. The activities embraced in these bureaus individually and collectively are so broad that it is desirable to present in more or less detail the leading features of each class of work rather than to attempt a statement in more general terms.

First to be mentioned is that branch of the service most fundamentally associated with the operation of the Treasury, the Bureau of the Mint. Of the various functions of this bureau that of coinage is the one by which it is popularly known, and this operation is generally conducted in three mints located at Philadelphia, San Francisco, and New Orleans. By special acts of Congress coinage operations are conducted not only for the United States but for the insular possessions of the government and also for certain South American states. The institution at Philadelphia is by far the largest, and furnishes employment for over six hundred persons. It is also the best equipped, through the generous provision by Congress of the magnificent structure completed in 1901 at a cost for building and equipment of about two and one-half million dollars. The improvement is not confined to the building alone, for upon the transfer of the coinage operations from the old to the new mint many changes were inaugurated which mark great advances in the state of the art. In general terms it may be stated that the most important results accomplished consist in the transmission of power

by electricity with motors applied directly to the individual machines; and the adoption of gas as fuel for the melting, annealing, and hardening processes, whereby, with the introduction of improved rolling machinery, the use of draw-benches for adjustment of silver strips has been eliminated. Moreover, the institution has been planned on a large scale with a capacity more than double that of the old mint, and future increase in output will be obtained with a moderate increase of operating expenses.

A similar undertaking is being executed in the construction of the new mint building at Denver, Col., which upon its completion will probably supply the entire gold coinage for the United States.

It is needless to say that in the equipment as well as in the design of these new buildings the work of the technical graduate has been an important factor; and, in the application of the methods and systems employed, the results of years of experience and experimental research both in this and in foreign countries have been fully embodied. It is also gratifying that a number of Institute men have been identified with various branches of this service, and the equipment of the Denver mint is in the charge of an Institute graduate.

The work of the mints is not confined to coinage operations alone; and each year a large proportion of gold and silver mined in the United States and Alaska, as well as that imported, is deposited in a crude condition at the various mints and assay offices, and converted into refined bars bearing the stamp which certifies the "Government Standard" of fineness. These fine gold and silver bars are furnished to the public by an exchange system. For instance, a depositor of crude bullion in any amount over $100 in value may receive from the mint stock, as soon as the value of the deposit is ascertained by assay, fine gold bars or coin, at his option, to the full value of his deposit except for a small charge for melting, parting, assaying, etc. The system has proved so convenient that the operations are conducted on a very large scale, and the largest proportion of all the gold and silver bars consumed in the industrial arts is manufactured in the mints and assay offices. Moreover, refined bars are preferred for export, and are furnished for this purpose in large quantities in exchange for coin and bullion.

Combined with the production of bars required for coinage, the amount of the two precious metals to which refining operations were applied in the fiscal year 1902 reached the value of nearly $50,000,000, while the gold deposits for this year amounted to over $132,580,000.

Gold and silver received for refining either in a native state or in the form of manufactured articles is in every variety of fineness from the crude ore to the refined bullion produced by private refineries, chlorination, and cyanide works. The material to be operated upon is, therefore, in a most heterogeneous condition, and includes on the one hand bullion containing all the varied combinations of impurities familiar to metallurgists and on the other the jeweller's scrap alloyed with nearly all the metals used in the arts. Moreover, while it may be relatively a simple matter to establish formulæ and methods for treating the metals successfully in small amounts, under laboratory conditions, it is far more difficult to regulate the procedure when applied to the working of tons of metal daily. The special and frequently original methods now employed, in the assay laboratories and refineries of the mint, properly to conduct these operations not only of great magnitude, but also of the greatest delicacy and accuracy, are the results of continued scientific investigations and research on the part of the technical staff of chemists and metallurgists. As the result of the ability displayed, many of these experts have acquired great professional distinction.

Another money-making establishment, probably the largest and most complete of its kind in the world, is the Bureau of Engraving and Printing, in which all classes of paper securities are printed. United States notes, silver certificates, and also sheets of internal revenue, customs and postage stamps, together with a variety of certificates for commissions, licenses, etc., to the amount of over $150,000,000 in one year, constitute the output. Employing two thousand eight hundred and fifty persons and requiring an annual expenditure of over $3,000,000, it demands for its efficient control and management a highly organized system and the services of many technical experts. Much of the work is practical in character and requires manual skill, such as draughting,

engraving, and die sinking; but there are certain positions, such as chief of the Engineering and Machine division, engineer of tests, and chief engineer of the bureau, which call for a high order of executive ability, combined with a thorough practical and technical training. The results recently accomplished by the Engineering Division merit brief consideration, as, under the leadership of a young and energetic chief who has received similar training to that provided by the Institute, system is now being wrought out of a chaos of segregated sources of steam power, belt-driven machinery, and cumbersome and wasteful methods. A large and economical electric power plant has already been installed, and great progress made towards the substitution of the electric for all other methods of power transmission. The same improvement has been extended to the machine shop facilities, and a scattered and unsystematically managed equipment has been converted into a well-ordered, centrally located, modern shop, capable not only of repairing and remodelling old equipment, but of constructing new and special machinery. Noteworthy as are the results which have thus far been achieved, a more substantial progress, which would certainly result from the substitution of rotary power presses for the hand-plate presses now in use, has, as in the case of all labor-saving devices tending to reduce the number of employees, met with such powerful and well-organized opposition that attempts to secure proper legislation in this direction have been frustrated. If, therefore, certain methods and machinery long since abandoned by the most progressive private concerns are still employed in the government manufactory, it will in many instances be found to be due to causes not within the control of those occupying positions of responsibility, whose efforts are consistently directed to the promotion of the highest efficiency in the conduct of the bureau affairs.

One of the oldest as well as most efficient branches of the Treasury Department is the Revenue Cutter Service, organized by Alexander Hamilton in 1790 as a revenue marine corps, eight years before the establishment of the United States Navy Department. Founded by the Secretary of the Treasury, it has remained under his control, but in case of war the vessels and crews are subject to the

commands of the Secretary of the Navy by authority vested in the President by Congress. Beginning with the suppression of piracy along the southern coast and continuing through every naval warfare conducted by the United States down to the conspicuous action of the "McCulloch" at the victory of Manila Bay and its speedy arrival at Hong Kong with the first authentic reports, together with the subsequent feats of the "Hudson," "Morrill," and "Windom" in their co-operation with the navy in the vicinity of Cuba, the part played by the revenue cutters in defence of the nation and the protection of its commerce has been both valorous and brilliant. But even such strenuous and heroic service has not been confined to times of war; and, aside from the apprehension of smugglers and enforcement of the customs laws, the revenue cutter officers are intrusted with the protection of the maritime interests and the enforcement of the customs, navigation, steamboat inspection, and quarantine regulations, and, in accordance with an annual proclamation issued by the President, the protection of property by a vigilant patrol of the coast line from Cape Hatteras to Eastport, Me. An added responsibility of more recent origin is the prevention of illicit sealing in the Bering Sea, under the terms of the protocol entered into with Great Britain. In these Alaskan waters, to which vessels are annually despatched, the cutters "Bear," "Corwin," and "Rush," have performed most valuable but perilous duties in relief expeditions. Great assistance is also rendered the Life-saving Service by supervising the construction of its buildings and boats and drilling the crews of surfmen.

The *matériel* of the Cutter division deserves more than passing mention, and includes a total of about forty vessels of all types required to meet the various duties imposed. The first-class cutters, of which the "McCulloch" and seven sister vessels are representative, exemplify the finest product of modern naval architecture. With a developed speed of over seventeen knots and a coal capacity affording an economic steaming radius of three thousand miles, the "McCulloch" and other vessels of the type are pre-eminently fitted to perform special duties at all times and seasons. It is a noteworthy fact that all of these boats have been designed wholly by the

technical staff of the Cutter division, and constructed and equipped under its supervision.

Passing now to the *personnel* of the Revenue Cutter division, its officers are commissioned and appointed in the same way as are officers of the Navy, and a naval discipline of the crews is maintained. By act of Congress, in 1876 the cadet system of appointment to the Cutter service was authorized. Young men between the ages of eighteen and twenty-five who pass with highest rank the competitive examinations in subjects of about the same number and weight as are held for entrance to the Institute of Technology are selected to serve a probationary period, formerly of two years, but increased by act of 1903 to three years, devoted almost entirely to training in such technical branches as seamanship and navigation and a study of the customs and international laws. At the conclusion of the probationary period, those who are found qualified as the result of rigid professional and physical examinations are commissioned as third lieutenants and are in direct line for future advancement.

The above outline has been given to indicate the extent to which the merit system has been applied to this branch of service, and, as might be expected, the Engineer Corps are selected and trained with no less thoroughness and care. I cannot do better than quote the words of the present engineer-in-chief, whose efforts in common with the chief of the division and other officers have resulted in that *esprit de corps* which has been so frequently evinced by the efficient discharge of the widely diversified and frequently hazardous duties.

* "Appointments to the Engineer Corps of the service are made directly from civil life, and the fitness of candidates is determined by very exacting competitive examinations. The requirements have recently been increased, so that the majority of appointments are now made from graduates of technical schools and colleges. To be eligible for an appointment, a candidate must be between the ages of twenty-one and twenty-eight years, a citizen of the United States, and physically robust. He must have served not less than six months in the engine-room of a sea-going vessel, and be either a graduate of a full four years' course in a technical school or have

* *Cassier's Magazine*, March, 1899,

served eighteen months in a machine-shop. The professional examination includes grammar, composition, arithmetic, algebra, including the use of logarithms, trigonometry, geometry, mechanics and physics, electricity, chemistry, and machine designing. Questions are given which require a thorough knowledge of the various types of marine engines, boilers, condensers, screw propellers and indicators, their care and management, the prevention of accidents, and the various methods of repair. At the suggestion of the writer (Captain Collins), graduates in mechanical engineering from technical institutions, notably from Cornell University, Stevens Institute of Technology, the Massachusetts Institute of Technology, and the Kentucky and West Virginia Universities, after successfully passing the prescribed examinations, have been made eligible for appointment as second assistant engineers. This has resulted in bringing into the service some highly accomplished young men.

The *personnel* of the Revenue cutter service consists of two hundred and fifteen commissioned officers (one hundred and forty-four line and seventy-one engineer officers) and an enlisted force composed of petty officers, seamen, oilers, firemen, and others, aggregating one thousand men."

Turning now to that branch of the Secretary's office most familiar to the writer, the office of the Chief Clerk, the most important of the manifold duties are the administration and superintendence of the operating expenses of more than three hundred and sixty public buildings, comprising the post-offices, custom-houses, court-houses and sub-treasuries under the control of the Treasury Department. These buildings are as divergent in size and character as in their geographical location and range, from the custom house at Sitka, Alaska, a weather-boarded log building acquired from Russia under terms of the treaty of March 30, 1867, to structures of such magnificent character and proportions as have been completed in Buffalo, N.Y., and other large cities. Certain buildings are of great historical interest, but none more than the old custom-house at Monterey, Cal., whose foundations were laid by the Spanish government about 1816. Building operations ceased during the revolt of Mexico, and were subsequently resumed by the Mexi-

can goverment and the building partially completed and occupied. Following the American occupation, it was finally completed by the United States, so that it now stands as the work of three governments. The post-office occupies a large portion of many of these buildings, but those of most importance are designed to accommodate the District and Circuit Courts, the offices of the Collectors of Customs and Internal Revenue, the United States Pension Agent, Steamboat Inspectors, Weather Bureau, Railway Mail Service, Engineers of the United States Army, Lighthouse Board, Post-office Inspector, Local Civil Service Board, etc.

To equip with furnishings and provide heat, light, water, and a great variety of supplies, as well as to maintain an efficient janitor and engineer service in these buildings scattered throughout the length and breadth of the government possessions, is a task which requires for its successful accomplishment such masterful administration as can only come from the most intimate knowledge of every detail and its proper relation and significance.

To the present Chief Clerk, Mr. Wallace H. Hills, who for many years has been most intimately connected with this branch of the service is due the credit for organizing the effective systems of accounting and administration by which the interests of the government are safeguarded, and of originating those methods of transaction of the multifarious and complex business affairs which have resulted in its present efficient and economical management.

To maintain the buildings in proper condition for occupancy by the various departments requires an annual expenditure of over $2,000,000, somewhat more than half of which is required for the pay of the janitors, engineers, watchmen, laborers, charwomen, etc., numbering in all nearly two thousand employees. In every building a custodian is appointed, and these employees perform their duties under the direction of this official who also acts as the agent of the department in the purchase of supplies and the conduct of the other business.

In many of the smaller buildings the problem of heating and lighting and janitor service is comparatively simple. The management of the larger buildings, however, entails an extensive knowl-

edge of business and technical affairs. The New York court-house and post-office building, for instance, requires the exclusive attention of more than one hundred persons at salaries ranging from $2,900 paid for the services of a chief engineer to $325 received by the charwomen. Twenty-eight of these employees constitute the engineer force, which in this building has charge of heating, elevator, and electric lighting plants, requiring an annual consumption of nearly eight thousand tons of coal. Excluding the mechanism of the electric and post-office pneumatic tube plants and of the heating system, there are ten steam mail lifts, two steam freight elevators, four hydraulic passenger elevators, nine steam-pumps, and six small steam-engines to care for. The continuous lighting and ventilating service furnished for the post-office required for the fiscal year 1902 the generation of eleven hundred and forty-three thousand kilowatts of electrical energy. This output was produced at a total cost of less than $31,000, while the entire cost of operating the heating and mechanical and electrical equipment for this period was less than $55,000. In the year 1897, prior to the introduction of the electrical plant, $38,000 was paid for little more than one-half of the above amount of electrical energy furnished from a central station in addition to $35,000 for steam for heating, a total cost of $73,000. For the fiscal year 1883 the cost of gas and electricity for illumination only was over $61,000. In twelve other large buildings a great reduction in operating expenses has been effected in like manner by the installation of electric light plants; and, though they are all considerably smaller than the one described, the average unit cost of generation of electric current is no greater. Some of these plants have been operated since the early days of electric lighting, but within the past few years all of the older plants have been completely modernized and equipped with the highest grade of machinery and all labor-saving and economic devices of established worth and efficiency. The valuation of the entire generating equipment of about three thousand kilowatts capacity, including power boilers and auxiliaries, is approximately $400,000. The saving effected by this investment over other means of obtaining electric service may be termed

its earning power, which expressed in dollars on a conservative basis is not less than $100,000 per annum.

It is only by means of accurate systems of cost-keeping based upon reliable and exhaustive hourly log records of plant operation and the closest scrutiny and supervision of the purchase of supplies upon the part of the department, together with the hearty co-operation of the *personnel* in direct charge of the equipment, that such results are accomplished. Electric lamps, materials and supplies, also lubricating oils, are purchased for all of the plants under annual contracts at wholesale rates and under rigid stipulations relating to character and quality. Under a former system electric lamps, for instance, of which nearly sixty thousand are required annually, were purchased in perhaps over one hundred different lots at different times during the year from a large number of different local dealers in the various cities in which the plants are located, and under such conditions as rendered the determination of quality wholly impracticable. At present the award of the contract for the year's business is made only after an exhaustive test to determine the relative merits of the various lamps offered at their respective prices and an investigation of the competency of the prospective contractor, if he be unknown to the department. After the award, deliveries are made upon the requisitions of the department under a system of inspection which insures a rigid adherence to the technical requirements of the contract and guarantees uniformity of results.

The active competition with rates for electricity as furnished by the local electric lighting companies is not confined to those instances where plants are now operated. With the accurate knowledge based upon actual experience the department may determine with an assurance of certainty what may be accomplished in those buildings not now equipped with plants, and the presentation of these facts frequently results in counter-propositions on the part of the local lighting companies sufficiently favorable to justify acceptance. While the department pursues a broad-minded and liberal policy in dealing with these matters, yet the amount of money saved annually by the system is no small sum.

Aside from duties of an executive nature, the technical staff of

the Chief Clerk's office prepare plans and specifications for the installation of new electric light plants or extensions to those in service when required, and also systems of electric light wiring for those buildings now occupied in which illumination by electricity is either more desirable at the same cost or more economical than gas at the prevailing rates for both services. Within three years more than fifty buildings have been wired on account of one or the other of the above reasons. The performance of these duties entails a large amount of travel for personal investigation to ascertain local conditions as well as for inspection of supplies and the conducting of tests at either manufacturing establishments or at the various buildings. Most frequently the object is to determine by methods, either commercial or scientific, those particular qualities of the apparatus in service or under contract, which relate to its capacity, efficiency, and economical operation.

Desirable as it may be to reduce operating expenses to a minimum, it is equally important to maintain an absolute continuity of lighting service in the various plants and buildings under the control of the department. The cessation of light for a single hour of the day or night, for instance, in a building like the New York post-office, which is wholly dependent upon electricity for artificial light, would cause an embarrassment and a delay of mails which would work incalculable harm, and merit censure by the post-office authorities. In certain buildings an emergency or breakdown service connection with city lighting service is maintained, but even in those cases where this recourse is not available the department has been uniformly successful in maintaining an unbroken record with which, in this particular, but few even of the largest lighting companies can compare. This result is greatly to the credit of the chief engineers of the various plants, who, as the combined result of technical training or extended experience, maintain with unceasing vigilance a discipline that is almost military in its character and a constant watchfulness for the development of weakness or deterioration. The department in turn aims to spare no expense to provide for all contingencies which in its experiences have been found to arise, and the reliability, reserve capacity, and flexibility of

arrangement of the equipment is such as to provide many resources in the hands of a capable operating engineer.

All of the employees in the custodian service are appointed under civil service regulations and as the result of standing shown either by the registration system, or, in the case of chief and assistant engineers, dynamo tenders, and electricians, as the result of competition, technical examinations being generally held in the city in which the vacancy occurs. With one or two exceptions the salaries of first-class chief engineers range from $1,200 to $1,800, and assistant engineers from $720 to $1,200. The more important positions are those of great responsibility and such as to attract the services of technically trained men, and a number of these positions are now filled by graduates of technical schools and men of broad training and experience.

From the foregoing it will be seen that the Treasury Department differs from the other government departments in the breadth and scope of its diversified interests and in affording certain opportunities for the graduates of every course in the Institute. The work embraces nearly every field of applied science and industrial activity, and is intensely practical. In its economic aspects its fruits are instantly recognized and its influences far-reaching. To the worker in applied science who endeavors to widen and level the roadway over which all must travel, no less than to him who blazes the path of scientific inquiry, the public service offers careers of the greatest usefulness. Though the number of positions filled by technically trained men is not large, owing to the limited demands for expert service, yet the opportunities for advancement are probably as good as in other executive departments in which the salaries are fixed by statute. The work is dignified in character, and its influence and associations such as would tend to broaden the vision and develop originality and independence of thought. Above all, the work of this department demands that absolute integrity of character and fidelity to the public trust which is in keeping with the inexorable laws of the universe whose principles have been so firmly inculcated in the life of every true engineer and searcher for truth.

JULIAN E. WOODWELL, '96.

LOWELL INSTITUTE SCHOOL FOR INDUSTRIAL FOREMEN

This new Free Evening School, the prospectus of which was given in the October number of the REVIEW, was opened with simple exercises Oct. 2, 1903, and the instruction began October 5. One hundred and sixty-five applicants were admitted, but many of them were not properly fitted to take up the work. As the applicants were received mainly on the recommendation of their employers,— there hardly being time for the preparation for entrance examinations this first year before the school opened,— many men who were not qualified for admittance were allowed to attend the exercises and to learn for themselves their unfitness. The number of students that are attending at the close of the first term is seventy-eight, and nearly all these men are carrying the work satisfactorily, and are well able to profit by the instruction.

The occupations of the men are as follows: —

Blacksmith's helper	1
Car repair man	1
Civil engineer	1
Clerk	6
Draughtsmen	24
Electrical engineer	1
Electrician	2
Electric railway construction	1
Engineer	3
Engineer of construction	1
Inspector, switchboard, wire, meter	3
Instrument-maker	2
Laboratory assistant	2
Linemen or instrument men	2
Locomotive fireman	1
Machinist	14
Manager Municipal Light Plant	1
Meter testing or installing meters	2
Ordnance man	1
Pattern-maker	1
Station agent	1
Telephone engineer	1
Tool-maker	1
Miscellaneous	5
	78

It will be noticed that, although a variety of occupations are represented in the school, a few more than half the number of students are draughtsmen or machinists. The oldest man is fifty-four years of age, and the youngest man is seventeen years. Five men are older than forty years, and nine younger than twenty; but 50 per cent. of the students are between the ages of twenty-two and thirty. The average age is 26.9 years. The men are equally divided in the two courses,— mechanical, 39; electrical, 39,— and give promise of an excellent class for the second-year courses. The capacity of the school for the second year will, however, limit the size of the second-year class to fifty students, twenty-five in each course.

The school year for the first-year course — which is the same for both the mechanical and the electrical course — is divided into three terms. The first term of ten weeks began October 5 and closed December 11, the second term of seven weeks began December 28 and closes February 12, and the third term of ten weeks will begin February 23 and close May 2. During the first and second terms exercises are held Monday, Wednesday, and Friday evenings from 7.30 to 9.30; but in the third term, when studies are begun requiring no outside preparation, exercises will be held Monday, Tuesday, Wednesday, and Friday evenings. The programme is so arranged that two exercises of one hour each in subjects requiring outside study are given the same evening, and, as far as possible, an illustrated lecture follows a recitation or less formal lecture. It is believed that such an arrangement will prove more efficient than a plan to give longer exercises in one subject an evening. Each exercise in the drawing-room or laboratory will be two hours in length.

The Schedule of the First-year Course is as follows: —

FIRST-YEAR COURSE

Practical Mathematics	51	hours
Elementary Physics (30 h.) and Electricity (27 h.)	57	"
Elements of Mechanism and Gearing	34	"
Drawing	40	"
Total	182	"

The work classified under *Practical Mathematics* embraces the principles of Algebra, Solid Geometry, and Trigonometry, and the elements of Calculus. The theory and use of Logarithms and the Slide Rule are also included. It is proposed to give such parts of Mathematics as are of immediate practical value to the men in the work in which they are engaged and such mathematical training as is essential to the proper presentation of succeeding studies, teaching the elements well, and omitting as much of the complex portions as would not seriously affect the succeeding subjects. It will be the aim to ground well the students in the fundamental principles in the first-year course, and to extend the mathematical training in the application to the technical subjects and laboratory work that is to follow.

The purpose of the course in *Elementary Physics and Electricity* is to familiarize the students with the fundamental principles of general physics and to lay a foundation for subsequent studies. The lectures will be very fully illustrated by suitable experiments.

The course in *Elements of Mechanism and Gearing* includes the study of the motions and forms of the various mechanisms occurring in machinery, the manner of supporting and guiding the parts, and the forms of gear-teeth.

The course in *Drawing* includes systems of dimensioning, conventional representations, tracing, and drawing illustrating the classroom work in connection with the course in Mechanism, including problems in belting, the design of cams, quick-return motions, gear-teeth, etc.

Text-books are used in many of the subjects, but in some of the work, where the instruction differs widely from available books, printed notes are supplied to the students at cost. Although the courses are free, the students are expected to purchase such text-books, note-books, instruments, and other material as may, from time to time, be recommended throughout the course.

The instructors for the first year are as follows: Practical Mathematics, Harry E. Clifford and William A. Johnston; Elementary Physics and Electricity, William J. Drisko and Louis Derr; Elements of Mechanism and Gearing, Allyne L. Merrill; and Drawing, Charles F. Park.

The scholarship of the students and their ability to continue the courses is determined in part by examinations which are held at the close of each term, but regularity of attendance and faithfulness to the regular school work are considered essential. No reports of standing will be given to the students, but those students who are failing to keep well up with the work or to profit sufficiently by the instruction will be informed that they are not qualified to pursue the course advantageously. Those who complete satisfactorily the required courses of the two years and pass the examinations will be given certificates.

The proposed courses for the Second Year are as follows: —

SECOND YEAR — MECHANICAL COURSE

Mechanics	38	hours
Valve-gears	10	"
Elements of Thermodynamics, the Steam-engine, and Boilers	38	"
Elementary Hydraulics	10	"
Testing Laboratory (Resistance of Materials)	12	"
Steam and Hydraulic Laboratory	24	"
Mechanism Design (24 h.) and Elementary Machine Design (48 h.)	72	"
Total	204	"

The subjects taught in the course of *Mechanics* are statics, dynamics, and the strength of materials. The work includes the composition and resolution of forces; moments; the determination of reactions and the stresses in frames; velocities and accelerations; constrained motions and stresses in moving bodies; centre of gravity; moment of inertia; stresses in beams, columns, and shafting; combined stresses; and results of tests of materials.

The course in *Valve-gears* includes the study of the different types of valve-gears for steam-engines, the Stephenson link, and the design of simple and double valves.

The course in *Elements of Thermodynamics, the Steam-engine, and Boilers,* includes the properties of gases and vapors, especially steam; the flow of gases and vapors; hot-air and gas-engines; steam-engines; the steam-engine indicator; air-compressors; and steam-boilers, their details and accessories. These subjects will be treated

in a practical as well as in a theoretical manner, with a view to their application to work in the laboratories or in practice. Attention will be given also to the theory and practice of the steam-engine, including simple, compound, and triple expansion engines, their construction and efficiency. There will also be some discussion of the accessories leading to the most economical use of steam, and the latest devices by which economy may be increased.

In the course of *Elementary Hydraulics* the fundamental principles of hydraulics will be taught, including the flow of water through orifices and pipes, and over weirs.

In the *Testing Laboratory* the student will make the following tests: tests to determine the compressive strength of short struts and columns, the shearing modulus of elasticity and torsional strength of two-inch steel bars; the modulus of elasticity, the limit of elasticity, and the tensile strength of steel or iron rods; the modulus of elasticity and the tensile strength of wire; and tests of the deflections and of the transverse strength of full sized beams, and of the strength of hydraulic cement. This laboratory instruction will be given in connection with the lectures upon the Strength of Materials, and the students will take all the observations and calculate the results of each test.

The work in the *Steam and Hydraulic Laboratory* can best be illustrated by the tests that will be made by the students. They include steam-engine tests on a 150 H. P. triple-expansion engine and on a 225 H. P. high-speed tandem compound engine, tests of the performance of a surface condenser, of a duplex steam-pump, of a 36 H. P. gas-engine, of a pulsometer, of a rotary pump, of the steam-injector, of a three-stage air-compressor, of a forty-eight-inch Pelton water wheel, and of other apparatus.

The main object of the course in *Mechanism Design and Elementary Machine Design* is the application of principles learned in the class or lecture room to the solution of problems in design. The scope of the designs will be sufficiently limited to enable the student to make the necessary calculations to determine the strength of every part by means of principles already learned, and not by means of empirical formulas. It is believed that only by supplementing

the class-room study by such practice in the drawing-room can full benefit of the courses be obtained.

SECOND YEAR — ELECTRICAL COURSE

Valve-gears	10 hours
Elements of Thermodynamics, the Steam-engine, and Boilers	38 "
Steam Laboratory	16 "
Direct Current Machinery	12 "
Alternating Currents	18 "
Electric Distribution	33 "
Electrical Testing Laboratory	20 "
Dynamo Laboratory	52 "
Total	199 "

The work in *Direct Current Machinery* embraces the theory, construction, and use of the various types of generators and motors. Methods of testing, the study of characteristics and of parallel running, will also be included.

The lectures in *Alternating Currents* will begin with the consideration of the fundamental energy conditions for periodic current circuits, and will be followed by a discussion of such circuits in parallel, a treatment of alternating current generators and of transformers. There will also be some discussion of polyphase systems, the induction and synchronous motor, and the rotary converter. Throughout this work graphical methods will be much used.

Electrical Distribution embraces methods of distribution of both direct and alternating currents as applied to lighting, transmission of power, street railroads, etc. The work in direct currents includes the layout of central stations for lighting and power; the general principles of direct current distribution, series, parallel, and multiple wires; the use of boosters, storage batteries, and the auxiliary devices entering into the various direct current systems. In the consideration of the generation and distribution of power by alternating currents will be included questions of regulation, and of parallel running of alternators; the various application to power systems of polyphase motors, both synchronous and induction; and the use of the rotary converter with special reference to railway work. There will also be some discussion of the principles of high

voltage power transmission. This course will be fully illustrated by working models.

In the course of *Electrical Testing* performed in the Standardizing Laboratory, special attention will be given to the methods of measurement and testing which are of fundamental importance in technical work. It is intended to familiarize the student with instruments of the best design and with methods of approved value. In connection with the laboratory work particular attention will be directed to the various sources of error arising in experimental work, it being the intention to lay the foundation for an intelligent criticism of results. Graphical methods will be freely used, and emphasis will be laid on precision of results and economy of time. The work will include the calibration of ammeters, voltmeters, and wattmeters, for both direct and alternating currents, for high as well as low voltages, and for both large and small currents.

The work performed in the *Laboratory of Dynamo Electric Machinery* will embrace the determination of characteristics and efficiencies of both direct and alternating current generators and motors; the determination of the heating, regulation, and efficiency of transformers; investigations of rotary converters and synchronous and induction motors; and a complete test of a lighting plant. A portion of the time will be devoted to photometric measurements of arc and incandescent lights.

It has been the aim to adapt these courses to the needs of the persons for whom the instruction is intended and to include the study of those principles with which the men are not likely to become familiar in practice, and which will give them a fundamental training in those matters that will be of the greatest value to them in the work in which they are engaged.

It is possible that the amount of work attempted in the two years may be too large, but it is believed that an extension of the work over more than two years would be unwise, as the courses can be of benefit to only a comparatively small number of persons each year. By a careful selection of the men and strict oversight of the work, it is expected that the courses can be satisfactorily completed by a large percentage of the students.

It may be supposed that men who are following industrial pursuits during the day are not in a condition to receive instruction after their day's labor, and that the instruction under such conditions can be of but little profit; but it can be safely stated that for the first term of this school year, ten weeks, the students have spent two hours at the school three evenings a week and as many more hours at home in study three other evenings a week, and have achieved thorough efficiency in their studies.

CHARLES F. PARK, '92.

EDITORIALS

This year 1904 is one of peculiar significance to the Massachusetts Institute of Technology, for in 1804, on the seventh day of December, was born its organizer and first president, William Barton Rogers. Although the Institute did not receive its charter until 1861, although it did not open its doors to students until 1865, the vision of it early existed in the brain of Professor Rogers, and was presented, fully outlined upon paper by William Rogers and his brother Henry, in 1846. While it would be rash to assert that the Institute could not have arisen without the constructive mind, the eloquent voice, the tireless energy of President Rogers, no one can study the growth of the college without becoming convinced that its broad scope, its lofty ideals, its steadfastness to those ideals through every discouragement and danger, are due almost wholly to the initiative of the man who has pre-eminently the right to be called Founder of the Massachusetts Institute of Technology.

Above all is the Institute indebted to its first president for the spirit which has carried it through its serious trials to its present high position,— the spirit of earnestness. One unfamiliar with the inside history of the institution cannot appreciate what tremendous obstacles from without and from within have stood in the pathway

of its seemingly unfettered progress. Only a most unusual spirit in the founders and keepers of the Institute, only an absolute belief in the ultimate realization of the ideal held up to them by President Rogers, could have given them courage and faith to conquer. They saw, through his eyes, their goal, and no bitter disappointment on the one hand, no flattering temptation on the other, could swerve them from their road. The incorporators presenting themselves again and again before a legislature and a public deaf to their arguments, the first teachers submitting to every inconvenience and discomfort, the corporation and faculty standing shoulder to shoulder through the dark days of financial panic, those pledging their personal credit, these sacrificing a share of their pitiful salaries, — all were inspired by that extraordinary earnestness and that dauntless courage which have built the Institute out of nothing into what it is to-day.

Through these nearly forty years the Institute has been a growing industrial force, an enlightening educational force, above all a tremendous moral force. Not simply has it given a solid, useful education to thousands of young men, not only has it inaugurated systems of laboratory teaching that are models here and abroad, not merely has it revolutionized the industrial and commercial world by demonstrating the value of the educated workman, not only has it saved hundreds of young men, ill-fitted for the ordinary college course, from mental waste and ruin, not alone has it helped to free college and school alike from mediæval cant and stupid routine, but it has created a new understanding and appreciation of what a young man goes to college for. The influence going out with students from the Institute is more than that of good engineers, good architects, good chemists: it is the influence of sincere, ambitious youth trained in an atmosphere of honest, hard work, untiring effort, and enlightened common sense. The Institute may well be proud of her past students scattered over the world, builders of important works, holders of positions of large responsibility, believed in and respected: she may well be proud of the unmeasurable wealth which her sons have brought to these United States; but

she may be prouder still that during these thirty-nine years, through every hardship and temptation, she has unflinchingly demanded that her graduates shall, first of all and last of all, be men.

The ideal held up with such force and persistency by President Rogers was this: that the Institute of Technology should slowly but steadily develop into a great university,— great in influence rather than in numbers,— of which the corner-stones should be: (1) a searching study of the laws of nature; (2) the application of those laws to the welfare of mankind; (3) respect for all honest labor whether of the mind or of the hand; (4) patient, intelligent, and ceaseless industry. Because of their fundamental mediævalism and of their inbred classicism, the older universities had neglected science, had scorned utility, had been arrogant toward manual labor, had fostered, unconsciously perhaps, the idea that culture comes through absorption rather than through unremitting work. Pure science, and even applied science, have found places in the older universities; but they are there by sufferance. The educational marriage of the hand and the brain seems, in those universities, to be still far in the future; and, with the resort to those universities of hundreds and thousands of young men who go simply because it is the fashionable thing to do, the day when leisurely absorption shall give place to earnest work must seemingly be long postponed. Therefore, the Institute, which had twenty or thirty years the start, is certain to keep ahead in the building of an educational edifice upon the solid foundations laid by President Rogers and his colleagues, provided she is but true to her ideals, refuses to surrender her principles, scorns to seek wealth at the cost of unfettered opportunity, resists all persuasion that her work is being done or can be done by others, and keeps unswervingly upon the splendid course unerringly charted by her first great President.

In this promise of growth and of development half the value of the Institute's name and all the value of her degree of graduation lie. The statement was made some years ago (with what truth we do not know) that, although a share of the Chemical National Bank of New York was worth at that time $4,000, if the affairs of the bank were to be wound up that same share would bring little more than $2,000, even this, however, being a huge increase over the par value. These immense differences represented, respectively, what might be called the dynamic and the static prestige of that banking institution. Following this analogy, it may truly be said that the tuition fee represents the par value of the stock which a student buys in the Massachusetts Institute of Technology; that the eight or ten fold increase expresses the actual value, in earning power, of the education for which he has paid a sum so comparatively insignificant; and that the additional increase shown in the market value of the active shares of the bank stands for the added, intangible worth which the great reputation, the world-wide prestige, the confidence of the public in its still greater future, give to the Institute's degree. This general reputation, this intangible and inestimable thing which has been laboriously built up by the zeal, the enthusiasm, the self-sacrifice of the faculty and corporation, and no less by the professional work and the personal character of the thousands of past students, gives a young man an initial impetus in his profession and in his career that is beyond calculation. Like the national credit, however, this prestige may be easily destroyed. It cannot be upheld except by adherence to the highest ideals, it cannot long maintain itself unless the college is developing and aspiring, it cannot survive by one hour the downfall of the Institute itself.

Therefore, just as it behooves every citizen of the United States to do what he can to maintain the national credit, so it is necessary for every Institute man, from a selfish if from no other standpoint, to work for the upholding and upbuilding of the Institute's reputation. As professional men, as citizens, its great name is a most valuable asset, especially of the recent graduate; and its reputation, its stability, its future development, should be as momentous to every

alumnus as it is to the corporation and the faculty. This, too many of the alumni are prone to forget. They are apt to think of the Institute as a bargain counter instead of as a real mother whose life and reputation are, or have been, essential to their success. There was a day when some of her graduates were positively disrespectful to their Alma Mater, speaking in dispraise of her because in her early years of struggle and poverty she had shown them some real or fancied slight. Those times, happily, are past; and no man speaks of the Institute of to-day save with genuine respect. But on the part of her children this regard is still too frigid, too conventional, above all, too silent. And it does not translate itself, as it ought, into material support.

It is true that even the older Institute graduates are still too young, are still too much in a position where their money is needed for the development of their careers and for the education of their children, to enable them to give in any large measure to the Institute. But the very activity and success of those graduates would be the greatest aid that could be given to the Institute, provided those past students were to take pains to let men know that their success comes, as in almost every case it does in large measure, from the Institute training. Moreover, the education and capacities of Institute graduates are such that many of them are brought into very close relations with men of large means, into relations where they have exceptional opportunity to point out to those men how and where their money can be made of service for all time. Most persons of great wealth are anxious to use their money to do permanent good: many of them are especially solicitous to be of service to young men; and they have but to understand what the Institute is doing, have but to appreciate what it accomplishes for young men, and how its expenditures have borne and will continue increasingly to bear fruit a thousand-fold in the lives and the professional work of those whom it educates, to see at once that here is an opportunity for giving that is indeed exceptional. More than anything else at this juncture the Institute requires money; and it

is the duty, as it should be looked upon to be the privilege, of the alumni to procure for it the money that it needs. In doing this, they will not only benefit the Institute, but will discharge a personal obligation which every alumnus ought keenly to feel.

The atmosphere of earnestness already referred to has been always so potent that the question of student discipline has been a comparatively easy one at the Institute. In many aspects of student behavior the undergraduate body has been practically self-governing. It may be that it is now ready for true democracy in all questions involving individual morality. It is a matter of much interest, therefore, that the students are seriously considering the question of asking the Faculty to inaugurate the so-called "Honor System" at examinations. The suggestion of such a change of policy ought to come, of course, from the undergraduates, and such a request should not be listened to unless it is practically unanimous. Moreover, the students who ask it should be prepared, and should show themselves prepared, to administer the system themselves. Such responsibility as is implied in the honor system cannot be imposed upon young men: it must be assumed by them voluntarily; and they should not be permitted to take it unless they show themselves fully alive to what the assumption of such responsibility involves.

This honor system means, of course, on the part of the Faculty the delegating of responsibility for honesty in examinations to the students themselves: it means on the part of the students an absolute determination to keep the honor of the student body above suspicion, not only by a willingness on the part of every student to resist the slightest temptation to secure help from forbidden sources, but also by a most rigorous treatment on the part of the student body of every offender.

Two things are necessary, then, on the part of the students: first, that the sentiment in favor of introducing the honor system be so pronounced that it may be certain of uncompromising support by

a majority of the student body so overwhelming that any act of cheating will be regarded as an insult to its dignity; and, secondly, that the undergraduates either devise the machinery of a court of justice that will bring any alleged offender against the student honor to prompt but absolutely unbiassed, trial, and secure his formal punishment, or that they so ostracize him by general sentiment that his continuance in the class, at least without immediate reform, becomes intolerable. So much is at stake in this question of student honesty that there is no room for hesitation, for paltering, for the shadow of a compromise. Until it can be secured, as it should be, by an appropriate student spirit, it must, unfortunately, be guarded by Faculty supervision. But as soon as the Faculty become convinced of the sincerity of the student body and are reasonably certain that it will succeed in enforcing its will in the case of individual transgressors, they should grant the honor system, and they should grant it in such a way as to throw the responsibility for its success entirely upon the shoulders of the student body; for any division of authority would be a fatal weakness in the system, and would bring speedy disaster to the experiment.

That the honor system is pre-eminently in harmony with the spirit of the Institute scarcely admits of discussion; for the voluntary habit of strictly adhering to the truth is the most fundamental condition to success in scientific work. The REVIEW is, moreover, of the opinion that there are few, if any, educational institutions in the country where the general character of the students — their earnestness of purpose and their devotion to work for its own inherent worth — makes a trial of the system so hopeful. The students are therefore to be congratulated on their discussion of this question; and the earnest wish may be expressed that the matter shall not be allowed to rest till such a sentiment is developed as will warrant an adoption of some such plan as is under consideration.

GENERAL INSTITUTE NEWS

CORPORATION NOTES

The three hundredth meeting of the Corporation was held at the Institute December 9, the business consisting of the presentation of the annual reports of the President and the Treasurer. Extracts from the former report will appear in the April issue. Following is the general report of the Treasurer: —

The net result of the year is a deficit of $36,432.14 in income compared with current expenses, and this, too, in spite of an increase in students' fees amounting to about $33,000. This is the largest deficit in the history of the Institute; and yet there was never a time when the number of students was so large, or the vigor and success of the different departments in the matter of education so great.

Going back to the year 1891, we find the number of students was then 937: this last year it has been 1,608.

If the present deficit were considered by itself, it might be accounted for in part by an increased expenditure for coal due to the exceptional conditions of last year, and amounting to about $15,000, and in part by expenditures indirectly growing out of the rapid growth of the Institute, which has necessitated the construction of new buildings and a large increase in equipment. The expenditure for the new buildings themselves, and for new machinery to equip them, is not included in the above figures. But if we go back to 1891, and follow the figures from that time to the present date, we find that the increase in expenses has been greater proportionally than the increase in students, and that this has gone on year by year, and that such increase is not limited to any one item, but embraces all the principal ones. The underlying cause seems to be that with the progress in technical education in all high-grade technical schools more and more is required of any educational institution which aims to hold a foremost rank. There was never a time in the history of the Institute when the facilities were so good or when so much was offered to its students as at the present time.

The total property of the Institute amounts to a little more than $3,600,000, not including the land on Boylston Street. Of this real estate and equipment represent just about one-half. Of the $1,800,000, in round

numbers, which is invested in interest-bearing securities, something over $800,000 is held for scholarships or similar purposes, leaving only about $1,000,000 of personal property from which income is derived for current expenses. To this should be added the rents, amounting to about $10,000, received from a small portion of the real estate, and making a total available income of about $50,000. It is manifest, therefore, that the income from endowment is insignificant as compared with annual expenses, which this year amount to about $468,000 apart from those paid from funds for scholarships and the like. The main support of the Institute is derived from students' fees. Any one familiar with educational institutions of the first rank knows that it is practically impossible to support them simply on the revenue derived from students' fees. This difficulty is especially great in the case of technical education, where the proportion of instructors to students must be large, and where new and expensive apparatus is constantly required. It should be borne in mind that our tuition fee has been raised above that of any similar educational institution in the world, and cannot be further advanced. The grant from the State of $25,000 per annum for ten years cannot be relied on as permanent. The recent action of the legislature in giving to the Institute the fee of the land on Boylston Street makes possible further growth either by using more of that land or by selling what land we now own and removing to some less expensive site, but in either case large additional endowment is necessary. If we remain where we are, we must have money for new buildings, and even then our present limits will be outgrown before many years are past. If we move, the proceeds of the land sold will not suffice to purchase new land, erect new buildings, pay expenses of removal, and provide any satisfactory endowment for carrying on the work. The problem which confronts us is not one appealing only to friends of the Institute or to local pride. It is freely acknowledged both in this country and in Europe that the work done by the Massachusetts Institute of Technology in technical education has been of the highest value to all, and its continued success should be a matter of interest to all who believe in the importance of higher technical training. It is, however, manifest that to provide adequately for the future a large additional endowment must be secured ; and this is a subject demanding most careful consideration from all friends of the Institute.

The following memorial of Dr. Frank A. Hill was presented by Mr. Munroe: —

Hon. Frank Alpine Hill, Litt.D., who died on Sept. 12, 1903, after a long and trying illness, was a member of the Corporation of the Massachusetts Institute of Technology both by election and by virtue of his office as secretary of the Massachusetts State Board of Education. His elective membership dates from October, 1893; his *ex-officio* membership, from May, 1894.

Born Oct. 12, 1841, in Biddeford, Me., of parents both of whom had been teachers, Mr. Hill began his notable career as a schoolmaster as early as his seventeenth year; for at sixteen he entered Bowdoin College, and he largely paid his expenses therein by teaching in the long vacations. With the exception of the years 1864 and 1865, during which he studied law, the forty-two years from his graduation in 1861 until his untimely death were given to educational work. His earlier experiences as a teacher were in Maine; but in 1865 he took up his residence in Massachusetts as principal of the Milford High School. Remaining five years in that position, he left it to take the principalship of the Chelsea High School, where he continued for sixteen years. In 1886 he was made master of the then newly created English High School in Cambridge; in 1893 he was chosen head-master of the just-opened Mechanic Arts High School in Boston; and in 1894 he was selected by the State Board of Education to be its secretary,— a position in public education that, ever since the time of Horace Mann, has been the most honorable and influential in the Commonwealth.

This high office Dr. Hill filled with extraordinary conscientiousness and zeal. He kept himself well informed upon the progress of education throughout the State; his annual reports are able and well-written papers; and he initiated and influenced the passage of much wise school legislation while exerting his personal and official strength with no less effect to prevent the passage of much bad legislation. Notable among his contributions to educational progress in the State were in the direction of extending free secondary education, of raising the standards of training for teachers, and of requiring expert supervision for every school in the Commonwealth. Greater, however, than his recorded acts was Dr. Hill's personal influence upon the thousands of teachers and pupils who came under his supervision. He was remarkably successful as a teacher, extraordinarily sympathetic as a man. He possessed, moreover, rare courtesy, unfailing optimism, and tireless enthusiasm. Therefore, his presence in a school-room was an inspiration to both

teacher and pupil, and his advice and admonition tended always to encourage and to develop rather than to discourage and to crush.

Despite the great labors of his office, Dr. Hill brought this zeal, this knowledge, this optimism, to the service also of the Institute of Technology. He might easily have pleaded the *ex-officio* character of his connection as an excuse for taking no active part in the work of the Corporation. On the contrary, he was remarkably faithful in his attendance upon its meetings and in the work of those committees with which he had to do. His long connection with secondary education, his thorough understanding of the problems of the preparatory school, his close relations with education throughout the entire State, above all, his genial wisdom and optimism made him a most valuable accession to this board; and its members heard with deep sorrow and regret of his death in the prime of life and at the height of his public usefulness.

Announcement was made of the transfer of the School of Design of the Lowell Institute to the Museum of Fine Arts.

REGISTRATION NOTES

Among points of interest in the usual statistics included in the President's report are the following: —

The Faculty has increased from 65 to 69, the Instructors from 54 to 66, the Assistants from 46 to 51, the Lecturers from 39 to 41,—a total increase of 23. This is due in part, however, to the inclusion of the new Research Laboratory of Physical Chemistry.

The total number of students, 1,528, shows a decrease of 80, but remains 113 larger than two years ago. The comparison with last year is, in some measure, misleading on account of the effect of the advances in the tuition fee and in entrance requirements in leading students to enter last year rather than this, if possible. The candidates for advanced degrees have increased from 12 to 13, the regular fourth-year students from 195 to 238, the regular third-year students from 230 to 238, the regular second-year students from 279 to 288, the special students from 455 to 490. The regular first-year students, however, have de-

creased from 433 to 255. The advance in entrance requirements by the addition of a modern language has resulted in the temporary classification of an unusual proportion of the entering class as special in consequence of deficiency in modern languages. The apparent falling off in the size of the first-year class is thus to some extent offset by the increase in the number of special students.

The distribution of regular students by departments shows a material increase in mechanical engineering and a slight falling off in chemistry and chemical engineering. The number of new students entering before the issue of the catalogue is 486 against 659 last year and 571 the year before. The number of graduate students has increased from 161 to 173. The list of foreign countries includes: Armenia, one; Australia, three; Bermuda, one; Brazil, three; Chili, one; China, two; Cuba, three; Denmark, one; England, four; Germany, two; Ireland, one; India, one; Japan, two; Malta, one; Manitoba, one; Mexico, eight; New Brunswick, one; Nova Scotia, nine; Ontario, two; Quebec, one; Scotland, one; Syria, one.

The number of students entering from other colleges at the beginning of the present term was 104, of whom 60 are graduates. The number who entered on examinations is 237; those who passed the examinations, but did not enter, 77; 94 were rejected.

The main list of scholarship holders for the present year numbers 239, including 60 receiving half or full state scholarships. The effect of the increased tuition fee on the demand for scholarships is not important the present year, as grants are rarely made to entering students. After the present year the difficulty of providing for those whose needs justify help will be considerably increased.

CHANGES IN ENTRANCE REQUIREMENTS

A number of changes in entrance requirements will be shown in the new catalogue. The addition of physics to the list of requirements for 1904 was announced last year, and an examination will be offered for preliminary candidates next June. As a result of this addition and of holding two examinations in algebra,

three full days will be necessary for the entrance examinations instead of two and one-half as heretofore, and June examinations after the present year will begin one day earlier. The place of physics in the list of elective subjects will be taken by biology.

An administrative change of some importance permits the division of entrance examinations between June and September of the same year. Heretofore candidates have been allowed to divide only between June of one year and June or September of the next year. The increased number of examinations seems to render some relaxation of formal restrictions advisable, and under the new rule a candidate will receive credit in June, if he passes as many as three subjects, for admission either in the following September or a year later. In the one case he will be termed a "partial" candidate, in the other a "preliminary" candidate. A preliminary candidate must present, as heretofore, a teacher's certificate as to his preparation for examinations taken. A preliminary candidate may also take examinations in September, but is not entitled to repeat in September examinations in which he has failed in June. Preliminary candidates are advised not to offer English or the whole of algebra, as it is desired by the Faculty that both of these subjects be included in the work of the final year before entrance.

The definitions of entrance requirements in mathematics have been replaced by those of the Committee of the American Mathematical Society; but none of the changes is radical in character.

PUBLICATIONS

The present issue of the Annual Catalogue will be found to contain several important changes. Chief among these may be noted the following: The matter descriptive of courses and methods of instruction, laboratories, libraries, etc., and the tabulated schedule of topics have been completely rearranged under the following divisions: first, Description of Subjects of Instruction; second, Laboratories and Equipment; and, third, Libraries. Under the first of these headings a short general introduction stating the object and lay-out of the work of each department is followed by a specific

description of the scope of every subject offered in the several courses at the Institute. A statement of the preparation required for each subject, and the name of the instructor teaching it and the courses taking it, are also included. The subjects are grouped according to the departments in which they are given, and are so arranged that related subjects follow in sequence. It is believed that this new method of presentation of the work offered by the Institute will not only be found more definite and satisfactory to students wishing to prepare themselves for entrance with advanced standing, but will also give the general reader a much clearer idea of the nature and scope of the subjects taught.

Under Laboratories will be found an introductory statement, historical in character, on the establishment of the various laboratories, followed by a somewhat detailed statement of their equipment. The section under Libraries is treated in a similar way.

As previously announced in the REVIEW, the Alumni Register will hereafter be omitted from the Catalogue, and issued as a separate publication in March. The usual statement regarding the alumni societies will, however, be retained in the Catalogue; and in place of the register there have been prepared a number of tables of statistics, including graduates by courses, geographical distribution of graduates, and statistics regarding their occupations. These, it is hoped, will not only be found of general interest, but also helpful to students in selecting their courses of study.

A new general circular on the work of the Institute is being prepared by the Dean for distribution at the Institute exhibit at St. Louis, and the Department Circulars are being brought up to date for a similar purpose.

GENERAL A. P. ROCKWELL, PROFESSOR OF MINING ENGINEERING, 1868–73

Alfred Perkins Rockwell, who died on Dec. 24, 1903, a son of John Arnold Rockwell, M.C., was born at Norwich, Conn., Oct. 15, 1834. He graduated at Yale College in 1855, where he was one of the crew in the first Yale-Harvard regatta. He studied mining engineering at the Yale Scientific Department for two years,

at the Museum of Practical Geology in London, and at the School of Mines in Freiberg, Saxony, for one year each.

Soon after he had completed his studies, the Civil War broke out, when he joined a regular United States battery (Tidball's), and served as a volunteer second lieutenant.

In January, 1862, he was commissioned captain of the First Connecticut Light Battery, went with his command to South Carolina, and served on the Atlantic coast for over two years, several times receiving special mention.

In April, 1864, he joined the Army of the James, and was commended by General Terry for his services at the battle of Swift Creek, May 9 and 10. During this latter month he was promoted chief of artillery, First Division, Tenth Army Corps. In June he was commissioned colonel, and took command of the Sixth Connecticut Infantry in the Army of the James, and continued in this command until he retired in 1865.

At the close of the war General Rockwell was appointed professor of mining at the Sheffield Scientific School, and in 1868 was called to the same chair in the Massachusetts Institute of Technology. After the great Boston fire he was made chief of the fire department, and rapidly reorganized it upon an efficient basis. He was made president of the Eastern Railroad Company previous to its lease to the Boston & Maine Company, and was subsequently the treasurer of the Great Falls Manufacturing Company. In 1886 he retired from active affairs.

General Rockwell was a member of the Geological Society of France, the American Academy of Arts and Sciences, the Boston Natural History Society, the American Association for the Advancement of Science, and of various social clubs in Boston.

CONFERENCE OF TEACHERS

By the courtesy of the Technology Club a reception for teachers was held on Saturday afternoon, November 14. The Institute's representation included the President, the heads of departments, and members of the instructing staff connected with first-year work.

About fifty principals and other teachers of secondary schools were present, including points as remote as Exeter, Holyoke, and Newport, but mainly from Boston and suburban towns. An informal lunch was followed by a brief address by the President, after which Professor Cross made a statement in regard to the physics requirement, and the Secretary an explanation in regard to changes of rules. On both subjects interesting discussion followed. Opportunity was also offered for comparison of notes in regard to the progress of students who have come to the Institute this year from the schools represented.

THE BRITISH EDUCATION COMMISSION

The British Education Commission, made up of leading educators of Great Britain and Ireland, and brought by Mr. Alfred Mosely to study methods of teaching in the United States, spent the week of October 26 in Boston. On Tuesday of that week they were entertained at luncheon at the Technology Club by the Faculty, and spent the afternoon in visiting the laboratories of the Institute. Some of the members spent almost the entire time of their visit at the Massachusetts Institute of Technology.

GENERAL NOTES

The Natural History Society has brought a suit in equity against the Institute, to restrain it from building on the ground between Walker and Rogers. The outcome of this suit will decide definitely the value of the title which the Institute has to this land.

The following officers of the College Entrance Examination Board have been elected for 1903–04: chairman, President Butler, of Columbia; vice-chairman, Professor Tyler, of the Institute; other members of the Executive Committee being Dean Crane, of Cornell, President Woolley, of Mount Holyoke, and Mr. Croswell, of the Brearley School, New York; secretary, Professor Fiske, of Columbia.

At the forty-seventh regular meeting of the North-eastern Section of the American Chemical Association, on November 27, the fol-

lowing officers were elected: president, Professor W. H. Walker, of the Institute; vice-president, Henry Howard, '89; secretary, Mr. A. M. Comey; treasurer, W. E. Piper, '94; Executive Committee, Henry Fay, of the Institute, Messrs. H. A. Torrey, J. B. Marble, A. E. Leach, '86 and W. K. Robbins; councilors, John Alden, '77, C. R. Sanger, H. P. Talbot, '85.

The retiring president, Dr. Gill, of the Institute, addressed the section on "The Limitations of Technical Analysis," in which he discussed some of the various compounds which the analytical chemist is likely to meet and the difficulty of analyzing them. This was followed by a paper by Dr. Burns, also of the Institute, illustrating some experiments with colloids.

President Pritchett has been elected one of the vice-presidents of the Massachusetts Schoolmasters' Club.

Professor J. O. Sumner was elected president of the New England History Teachers' Association at its meeting held in November.

Professor A. A. Noyes has been elected president of the American Chemical Society for the year 1904.

In the Boston *Record* of November 28 was printed an extended notice of Mrs. Margaret E. Stinson, who has been in charge of the apparatus room of the first-year Chemical Laboratory since the beginning of the Institute. Every person ever connected with the Institute holds this kind lady, with her wonderful memory for names and faces, in warmest remembrance.

DEPARTMENT NOTES

CIVIL ENGINEERING

In the Department of Civil Engineering there are three assistants from other colleges, namely: D. A. Allee, University of Minnesota, 1902, George A. Sampson, Thayer School of Dartmouth, 1903, and W. E. Burkhalter, University of Illinois, 1903. Mr. Allee will assist Professor Allen, having had over two years' experience in railroad work as assistant engineer on the Chicago Great Western Railroad. Mr. Sampson has had nearly two years' experi-

ence in city engineering work with Cheney Brothers, South Manchester, Conn. Mr. Burkhalter was recommended by Professor Baker, in charge of the Civil Engineering Department of the University of Illinois, and has had two summers' experience on railroad and surveying work.

The other three new assistants are our own men, '03 and '02,— W. R. Davis, H. S. Morse, J. W. Howard, '03. All of these men have had summer experience during one or two years.

ARCHITECTURE

The work in the present graduate class in architecture to this period is of especial merit, and is well worthy of a visit to the Exhibition Room where it is now hanging. The graduate course is certainly the means of fostering high-class work, and it is extremely interesting to watch the standard of excellence steadily increase since the course has become completely recognized. This standard results in the opportunity for uninterrupted work in elective studies, just at the time when the students are ripe for it. The conditions are conducive to special effort, and, undoubtedly, the increasing number adds stimulus; but the stride made from the very beginning of the fifth year is always surprising. During the regular course the student has been drilled in method, the way to design. The architect's knowledge of method is wherein lies his strength. Soundness in the principles of composition and construction is what makes him an architect. Whether he uses for the expression of his design classic, mediæval, or renaissance detail, is entirely a personal matter. But it is well that the student should have the opportunity to use a different style than the one which the limits of the regular course has obliged him to hold to, for it is better at the beginning not to cover too much ground. And with this opportunity he will see that to exchange one style for another is the least part of design and not so difficult a matter now that he has become more expert in method. So, in alternating problems during the rest of the year, some subjects will be chosen as representative of American needs of the day, to give opportunity for the most serious study from both the practical and artistic points of

view, and others for training in historical style and detail through archæological problems, such as a Greek or Roman restoration or an important study in Mediæval Gothic.

That the results from such a course cannot be overestimated attention only need be called to the annual address of Mr. R. S. Peabody when president of the American Institute of Architects:

"It is the standard of graduation that finally tests the school, and the need now is for high-class post-graduate work; and it is certain that those schools in architecture among us will quickly be distinguished as the real architectural universities, which depend, not on the funds or number of students, but on their advanced graduate instruction and on a body of strong students banded together with *esprit de corps*."

The Architectural Department has just come off victorious in a competition representing the first talent among old and young throughout the country.

The well-known architectural journal, *The Brickbuilder*, through the generosity of the terra-cotta manufacturers, was enabled to offer three prizes in competition for a public library assumed to be presented to a town located in the Middle West.

There were nearly 300 competitors, representing established firms and draughtsmen everywhere. The competition was decided on Saturday, January 2, with these results: —

1st prize, $500, Frederic C. Hirons, student M. I. T.

2d prize, $200, Calvin Kiessling, student of Professor Despradelle at the Boston Architectural Club.

3d prize, $100, W. D. Crowell, student M. I. T.

Among the Honorable Mentions were I. P. Lord and A. P. Wadsworth, both students of M. I. T.

CHEMISTRY AND CHEMICAL ENGINEERING

Professor F. L. Bardwell, who is abroad on leave of absence, is at present studying at the University of Leipsic in the laboratory of physical chemistry. He expects to remain at Leipsic for a considerable portion of the winter, but may take lectures at Berlin or Zürich before his return.

The instruction in Inorganic Chemistry given to all students during their first year at the Institute has now been so arranged that students who have already spent a year or more in the study of chemistry in secondary schools may take up a somewhat more advanced course of lectures and experimentation, in which the knowledge of the science already gained is utilized. The results from this differentiation in the work of the class are most satisfactory, both in recitation and laboratory practice, since it is now possible to treat the subject in a way to maintain the interest of the more advanced student without bewildering the beginner.

The system of recitations in connection with first-year inorganic chemistry in the first term has been in operation for several years; and the results have been, on the whole, so satisfactory that the Faculty has now made a similar provision for the second term also.

Another noteworthy advance of the present year in methods of instruction is the introduction of laboratory practice in connection with the course in Theoretical Chemistry in the first term of the fourth year. This is given in one of the rooms adjoining the Research Laboratory of Physical Chemistry, and is under the direction of Professors Noyes and Whitney, assisted by Dr. J. W. Brown. The opportunity afforded by this course of laboratory instruction for the illustration and verification of the laws and principles discussed in the class-room serves to change many an abstract notion to a concrete understanding of the significance of so-called "theory" and its relation to practical work. It is believed that the facilities for work in Physical Chemistry now offered by the Institute are unsurpassed.

The opportunities afforded to the members of the instructing force of the Chemical Department to attend the advanced lecture courses and seminars in connection with the Research Laboratory of Physical Chemistry are also unequalled elsewhere, and are a great stimulus to the maintenance of a broad interest in the science.

The course in Technical Machinery given in the chemical engineering course is to be replaced by a course of laboratory exercises relating to dynamo-machinery, as the subject-matter of the former course is now given elsewhere. A number of lectures upon the

Chemical Resistance of Materials have been made a part of the instruction in Applied Chemistry for this year, and the latter course is undergoing general modification.

Professor Walker has been appointed expert in charge of the chemical engineering exhibit, including analytical, organic, and applied chemistry, of the so-called "land-grant colleges" (of which the Institute is one) at the St. Louis Exposition. He is arranging for the exhibits of the various colleges concerned, and will later visit St. Louis to superintend their installation.

Professor Talbot is a member of a committee appointed from the American Chemical Society to take steps to secure a greater degree of purity in the chemical reagents furnished to American buyers. The committee will, in co-operation with the newly established National Standards Bureau, undertake to issue a set of standard specifications; and it is hoped that in time a desirable improvement in conditions may be brought about.

Professer Norris is in charge of the instruction in chemistry at Simmons College for the present year, and will have an important share in the development of the plans for the laboratories in the buildings now under construction for the permanent occupancy of the college.

NAVAL ARCHITECTURE

The necessities of the government service have rendered it important that the three graduate naval cadets now in their third year at the Institute should begin active service before the end of the present school year, and arrangements have been made for their release about April 1.

Three more naval officers have been detailed to take the course. They will form a class, just as they would had they come in last October.

MODERN LANGUAGES

With the increasing interest in the study of Spanish, application has been made by students for the acceptance of that language as a substitute for French or German. While the Faculty is not

yet ready to accept Spanish as a full equivalent, students have in several instances been allowed to offer two years of Spanish in place of a single year of French.

SOCIETY OF ARTS

During the present year the meetings of the Society of Arts have continued to be of especial interest to the people of Boston who are interested in the development and applications of science.

At the first meeting of the school year, in October, Mr. J. P. Fox addressed the society on "Rapid Transit in the Light of European Experience." Mr. Fox has made an extensive study of the rapid transit systems of Berlin, Paris, and Liverpool. He gave an account of the methods which had been used in Europe to reduce the noise to a minimum in running elevated railroads, and showed by means of a large number of lantern slides how successful had been the attempt to make elevated structures attractive in appearance.

At the next meeting, Captain W. H. Jaques described in detail the installation and mechanical efficiency of a solar motor which he had recently erected in Arizona. It was shown that engines which receive their energy from the heat of the sun may play an important part in the irrigation of some of the arid districts in the Western States.

In November Mr. William L. Underwood gave an illustrated lecture on "Mosquitoes and Methods for their Extermination." Mr. Underwood has made careful investigations of the life-history of the various kinds of mosquitoes which are common in New England. He showed how the facts which he had discovered had suggested a number of ways of combating the mosquito nuisance. An account was also given of a variety of mosquito, recently discovered by Mr. Underwood, which feeds upon the larvæ of the mosquitoes most common about Boston.

At the second November meeting Professor Simon Newcomb addressed the society on "One Field of Twentieth Century Science." The point emphasized most strongly was the necessity of

correlating the great mass of disconnected observations which had been made in all fields of science during the nineteenth century.

At the next meeting of the society Dr. H. W. Wiley, chief of the Division of Chemistry, United States Department of Agriculture, gave an interesting account of his investigation of the action of food preservatives on digestion. This important investigation was undertaken by the Department of Agriculture on account of the fact that some foreign governments had refused to admit meats from America which had been treated with food preservatives. Dr. Wiley was unable to give the conclusions which are to be drawn from his experiments, as the results have not been thoroughly worked out and experiments are now in progress. A detailed account was given, however, of the methods employed in the investigation.

Among those who have promised to address the society later in the year are the following: Mr. Charles Garrison, of the De Laval Steam Turbine Company, who will speak on Steam Turbines; Mr. George F. Kunz, expert in gems for Tiffany & Co., who will give an account of his study of the action of radium on gems; Dr. Alexander Graham Bell who will describe his recent investigations on flying machines; Professor Joseph Richards, president of the Electro-Chemical Society, who will give a résumé of the important advances in Electro-Metallurgy; and Dr. Cyrus Adler, who will describe the work and aim of the Smithsonian Institution.

THE UNDERGRADUATES

CLASS AND OTHER OFFICERS

'05 *Class Election.*— The following men have been elected officers for the coming year: president, A. J. Amberg; first vice-president, J. M. Lambie; second vice-president, P. E. Hinkley; secretary, C. L. Dean; treasurer, J. Daniels; Institute Committee, W. D. B. Motter, Jr., T. E. Jewett; Executive Committee, R. W. Morse, E. C. Weaver.

'06 *Class Election.*— The Sophomores have elected the following officers: president, J. T. Lawton, Jr.; vice-president, M. A. Coe; secretary, A. P. Mathesius; treasurer, A. H. Keleher; Institute Committee, C. F. W. Wetterer, E. M. Smith; Executive Committee, G. C. Simpson, H. J. Mann.

'07 *Election.*— The following men have been elected officers of 1907: president, George W. Otis; vice-president, Alexander Macomber; secretary, James H. Mulcare; treasurer, George A. Griffin; directors, Erskine P. Noyes, Orrin W. Potter.

Institute Committee.— The following are officers for the ensuing year: president, W. E. Hadley, '04; vice-president, A. J. Amberg, '05; secretary and treasurer, E. M. Smith, '06.

Musical Clubs.— The present officers of the M. I. T. Musical Clubs are: president, L. G. Wilson; business manager and treasurer, Louis E. Robbe; leader of Mandolin Club, Charles B. Mayer; leader of Glee Club, L. G. Wilson; leader of Banjo Club, Ralph Jackson.

Freshmen Orchestra.— The Freshmen Orchestra has elected A. T. Kolatschevski leader and H. L. Moody manager.

Chess Club.— The second meeting of the Chess Club was held Saturday afternoon, October 17, at the Tech Union. The following officers have been elected: president, H. M. Edmunds, '05; vice-president and business manager, W. I. Lourie, '06; secretary and treasurer, I. Niditch, '05; additional members of Executive Committee, G. Hill, '04, and F. J. Van Hook, '06.

PROFESSIONAL SOCIETIES

Civil Engineering Society.— The first meeting of the year was held October 20. After the reading of the secretary's report, Professor Swain gave an interesting talk on "The Opportunities of a Civil Engineer." This was the first of a series of talks by prominent speakers. November 9 Mr. L. P. Wason, '91, spoke on "The Harvard Stadium." On November 23 Mr. P. H. Dudley spoke on track testing. The lecture was well illustrated, thus enabling the lecturer to show his mechanisms and their operation in greater detail. December 17 Dean Burton spoke at the Tech Union on "The Summer School of 1903."

Mechanical Engineering Society.— The first meeting of the term was held October 27, at the Union, with about sixty present.

Mr. Dean, the speaker announced for the evening, was unable to be present; but his place was very ably filled by Mr. Byron Eldred, a graduate of Dartmouth, who talked on "Combustion."

Architectural Society.— The Architectural Society held an informal smoker November 19. The speaker, Mr. C. Howard Walker, gave a very interesting description of his journey through Spain.

Chemical Society.— The first meeting of the Chemical Society for the year was held October 30, at the Union. Over fifty men were present, and Dr. Talbot was the speaker.

Electrical Engineering Society.— The first smoker was held at the Union, October 26, with Mr. J. S. Stone as speaker of the evening. An intensely interesting talk upon the theory of "Wireless Telegraphy" was given. A second meeting of the Electrical Engineering Society was held at the Union on the evening of November 18. A talk on "Steam Turbines" was given by Mr. Charles Garrison, the New England representative of the De Laval Company. December 15 President Pritchett addressed the society at a smoker held at Tech Union, giving an account of his recent trip abroad. November 24 the society made an excursion to the power house of the Boston & Worcester Railway Company.

Geological Journal Club.— At the first meeting, held on October 14, a number of reviews were read. These meetings are held for the purpose of becoming familiar with the latest literature in geology and to discuss practical questions relating to mining. Meetings will be held every Wednesday at 4.15 in the geological department rooms, and a cordial invitation is extended to all interested.

CONVOCATIONS

The First Convocation of the year was held in Huntington Hall at two o'clock, October 5, with Dr. Edward Everett Hale as the speaker. After introductory remarks by Dr. Pritchett, during which he stated that he was then meeting the students for the last time before leaving for several weeks in Berlin, Dr. Hale spoke on the great work the American scientific schools were doing, their graduates replacing foreign engineers and scientific men in American industries. His talk was enlivened by anecdotes, and he closed by stating his three great principles for students such as he was then addressing: to live in the open air all that is possible; to rub elbows with the rank and file; to speak each day to some one you know to be your superior.

PRESIDENT PRITCHETT TO THE FRESHMEN

Extracts from his address at the opening of the year: —

I venture, as you are new-comers, to call your attention to one single announcement in this little pamphlet ("General Information") concerning the conduct of students. We assume here that those who come to us come to take up their work man-fashion, and that we may treat you as men. There are no fixed rules with which we ask your compliance. The injunction: "Be a gentleman," which is the rule in all the world, is all that we ask of men here. Now and then students have come to us who did not seem to understand that the obligations of a gentleman include absolute honesty in work, and this is one sin which we never forgive. No man can hope to be an engineer who will present as his own work that of another, and who will pass an examination by unfair means. Whenever we find such a one, we ask him to leave. . . . Life in the Institute means, first of all, as you have all

heard, work,— good, hard, honest work ; and life in the world anywhere means work, if men are to be real factors in it. The capacity to work and the disposition to work are in a large measure the qualities which separate savage peoples from civilized peoples, and the work which you are to find here is no greater and no less in amount than that which you will be called to do in any avenue of life . . . But I should be sorry for you to gain the idea that life in the Institute of Technology stands for nothing else but work, if work is to be used in the narrow sense of application to the utilitarian objects of an education. The Institute is standing more and more each year, as all educational institutions must stand, if they do their real duty to society, not alone for scholarship, but for fellowship; and no man can hope to be an engineer in the greater sense who has not some actual contact, day by day and week by week, with his fellow-men. Whatever course of engineering you may take, whether you are to deal with electricity or chemistry or mechanics, you are to deal, first of all, all your life long, with men. Various means exist in the Institute which look toward the cultivation of this social side, and yet which aim to preserve a due perspectlve in regard to more formal duties. The scientific societies which meet in the various courses serve as social groups, in which men meet each other. The Technology Club, which stands just opposite the Institute, on Newbury Street, includes a membership made up of the graduates and officers of the Institute, together with a certain number of students from the Senior and Junior Classes. I hope as many of you as can may find your way to its privileges and its associations. Last year was started, in modest rooms over the mechanical laboratories, what is perhaps the most democratic of all our efforts in this direction. That is what has come to be called "Tech Union," which is nothing other than a suite of comfortable rooms, provided by the kindness of a few friends, in which Institute gatherings may be held, where a dinner may be partaken of at small cost, and where it is possible for the poorest as well as the richest student to spend a comfortable and joyous evening in the company of colleagues and teachers. There are other agencies, which I will not take the time to mention minutely, which give our students the opportunity for intercourse and contact with those outside the Institute, which I hope you may avail yourselves of freely. And particularly let me commend to you as engineers that you avail yourselves of frequent opportunity to "rub elbows" with workingmen. As engineers, you must stand in direct contact with such men; and, if we are ever in this country to work out the problem of right relations between employers and laborers, you men who are engineers must help to that solution. You stand between capital and labor: you give

a hand to each. You ought to be able, if you are educated, broad-minded, sympathetic men, to understand that each of the parties in this dispute has rights which the other ought to respect, and that both have obligations to the public which they must in the end recognize and respond to; but they will be brought to recognize their mutual obligations and relations all the quicker if you men who are engineers can bring to the study of such problems an open mind, a judicial spirit, and a sympathetic appreciation of the difficulties of each.

There is one project in the Institute, the immediate aim of which is the promotion of this sort of contact, about which I will say just one word. Within a quarter of an hour's walk of this building lies a tenement-house district of the city of Boston, made up of 25,000 working people, factory hands, casual laborers, and the more poorly paid grades of clerks. It is a district almost barren of social influences, and in which the ideals of people are being shaped more and more by ambitious leaders, who become unconsciously, not only political leaders, but moral leaders. In the midst of this district stands what is called "Tech House," a three-story brick building, fitted and equipped as a residence, in which a half-dozen Institute students, sufficiently interested in the social and labor problems of the day to rub elbows with workingmen and workingwomen, have their home. In addition to these six men who are daily coming into contact with the population of this region there is need for several score of men who can give an evening or even an hour a week to some form of personal service. The men to volunteer are the men who can saw wood and show a group of small boys how to saw wood; men who understand the rudiments of telegraphy, who can make simple demonstrations in electricity for the edification of other men; steam-fitters and engineers; or men who can play ball or cricket or can do anything else to interest boys and men who have few wholesome interests in life and who will approach everything new without training and without discipline. Those of you who are willing to give an hour or an evening to such work will get your own reward in the knowledge of the real problems which concern the relations of capital and labor, which affect thrift and waste, and which have to do with the relations of the people themselves to politics.

I urge you all the more strongly to take some interest in these social matters, standing as we do in the midst of a great city, because the college education of to-day is being sharply criticised by business men and by others from this standpoint. The statement is made again and again that the college training of to-day develops the intellect, but not character, that it quickens a man's intellectual faculties, but does not enlarge his moral and social

sympathies. If that is a just criticism, it is a most serious one; for I can assure you most frankly that if your scientific studies here furnish you no suggestions as to your relations with other men, if they do not connect themselves with the philosophy of life and of conduct, if they do not strengthen your moral purpose and help to clear your conception of truth and of duty and quicken your sympathies with other men, then you have got only the husks of an education.

I believe this criticism is one to be met most frankly and fairly, but personally I do not believe that the criticism is warranted in any large measure. On the other hand, there have been some very conspicuous failures in the business world, of recent date, for lack of that very intellectual and moral poise which an education ought to give. I do think, however, that many men who come to college and to technical schools fail to think out for themselves the reasons why they come, and fail to recognize, therefore, the opportunities before them and the objects which they may attain.

So, if I may say to you a single word on your first day in the Institute, it is to remind you that character is above intellect, and to call your attention to the fact that the engineer of the next twenty years is to be called on for a vastly different service from that rendered by the engineer of to-day. Twenty years ago society demanded of the engineer very little besides technical skill. To-day technical skill is no less a *sine qua non*; but, if a man is to be an engineer in the great sense, he must be able to deal not only with things, but with men, and, in order to be able to do this, he must keep his sympathies and his ideals fresh in college as well as in every other experience of his active life.

THE HONOR SYSTEM

At a meeting of the Institute Committee held during the second term of 1902–03 it was decided to investigate the matter of Honor Systems in examinations, with a view of determining whether or not it would be practicable to introduce such a system in the Senior Class of the Institute. This committee suggested the appointment of a committee of four men and one chairman from the class of 1904 to determine whether or not it would be advisable to attempt to establish the "Honor System" at the Massachusetts Institute of Technology. The plan suggested was for this committee to publish during the first week of the next collegiate year printed slips stating the advantages of the "Honor System," and also some form

of pledge; to make it a point to interview personally every man in the Senior Class of next year, present him the printed slip, and ask him if he is willing to sign a pledge of honor; and, after a sufficient number of signatures have been thus obtained, to bring the matter up in class meeting and decide the question by vote of the class. If the question is decided in the affirmative, to see to the proper establishment of an undergraduate court, whose duty would be to manage the "Honor System" and settle all questions of violations. And, lastly, to convey the will of the class to the Faculty and to use every means in their power to have a first trial of the "Honor System" made in the mid-year examinations of the year 1904.

Acting on this suggestion, the Institute Committee appointed G. Bouscaren, Jr., G. H. Powell, G. E. Atkins, W. W. Cronin, and Currier Lang to carry out the measures recommended.

Extracts from The *Tech*: —

The practicability of introducing the "Honor System" has formed a subject for very serious discussion of late. Besides the consideration it is receiving from the investigating committee, the topic last Wednesday was the theme of a debate in Professor Pearson's Course in Argumentation, which set forth rather clearly the merits and demerits of the system from the point of view of the student. Believing the arguments and information produced to be of immediate interest to the student body, a report of the debate has been prepared for the expression of opinions in which the *Tech* does not hold itself responsible.

The topic as proposed was: —

"*Resolved*, That the introduction of the 'Honor System' in examinations at the Institute would be preferable to the present system." The first speaker for the affirmative was Mr. A. G. Drew. Attention was called to the method of examination in use at the Institute. The instructors, as proctors, take the place of spies, appearing unexpectedly, and silently walking around. It seems only a natural result that men consider it clever to outwit the proctors by cribbing. As a contrast, the working of the "Honor System," as evidenced in Southern colleges, was described, where the environment, tradition, and spirit of the men make cheating impossible. A list of several colleges where the "Honor System" has proven successful ended the first argument.

Mr. J. K. Elliot, on the negative, asserted that men do not dare to risk ex-

pulsion from the Institute for the satisfaction of evading examination requirements. It was contended that the instructors were not regarded as spies. A pledge not to cheat is expected under the "Honor System"; but what difference will signing a pledge make to a man who will cheat under present conditions? The "Honor System," while good in theory, is a Utopian idea, which to be successful must have indorsement from the student body as a whole. Twenty men could render it valueless by refusing to sign any pledge. It was claimed that the present system has given unquestioned satisfaction for thirty-nine years, for which reason a change seems entirely unnecessary. Moreover, other colleges with a proctor system have not been willing to change.

Mr. L. Schwartz, for the affirmative, insisted that the value of the "Honor System" depended upon a prime principle of human nature. Treat a man as a man, and he will be one; treat him as a sneak, and he will act accordingly. As a good illustration, the case of men attending lectures was considered. At one lecture noisy disturbance is a regular affair; at another the same men will instead preserve a gentlemanly decorum. The reason is that one lecturer treats them as boys, and they live up to his opinion of them; while the other lecturer, treating them as gentlemen, receives the respect due to his appreciation. Most men are naturally honest, and a way must be found to force the morally weaker men to be honest also. This, it was contended, the "Honor System" would do.

Mr. E. F. Parker, for the negative, claimed that there is no way at present of changing from the proctor system. The University of Virginia, the stronghold of the "Honor System," was founded on the purest democratic principles. This spirit always having prevailed, it is not unnatural that the "Honor System" should there meet with some success. In Northern colleges the customs and traditions are very different.

Mr. C. D. Simonds, for the affirmative, on the ground that, if there were no cheating now, no discussion of the "Honor System" would be necessary, assumed the existence of some dishonesty. The cause of this can only be referred to the system of examination now in use. Originally, examinations were oral; and, when written examinations had to be introduced, after discussing the proctor and the "Honor System," in the severer judgment of the time the former was decided upon. Proctors were appointed to catch the few delinquents, which was practically an announcement to the whole class that it was taken for granted they would cheat. With this encouragement, cribbing has come to be considered more clever than dishonorable. The object of Technology is to graduate men responsible enough to direct

other men, and a dishonest man can never be safely relied upon to do honest work. Only by habitual practice of honesty can lower tendencies be eradicated, and the "Honor System" proposes to make honesty a habit. With such training later temptations may be met with infinitely greater success.

Mr. D. K. Keller, for the negative, claimed that present methods are admitted by competent authorities to be honest and efficient. Only a comparatively small part of the men live near enough to the Institute to gain from associations the college spirit and feeling without which the "Honor System" must fall flat. Tech is purely a business proposition to so many men who attend that the affection for and pride in the college which would render the "Honor System" efficient are wholly lacking.

After a short interval a very interesting rebuttal followed.

ATHLETICS

TECH FIELD DAY, NOVEMBER 7

Field Day was cold, but bright. The first event, the football game, was begun at 2.40, and resulted in a complete victory, with a score of 17–0, for the Sophomores. The line-up was as follows: —

1906	1907
Reed, Taylor, l. e.	Starkweather, l. e.
Soule, Lasher, l. t.	Rood, l. t.
Moore, l. g.	Brotherlin, l. g.
Loring, Mathesius, c.	Morton, c.
Friend, r. g.	Griffin, r. g.
Henderson, r. t.	Hall, r. t.
Griffin, r. e.	Chapman, r. e.
Geist (Capt.), Eaton, q.	Mulcare (Capt.), q.
Barber, Santry, l. h b.	Lamont, l. h b.
Hardy, Williams, r. h b.	Loutrel, r. h b.
Coey, Geist, f b.	Frederick, Prendergast, f b.

Score: '06, 17. *Touchdowns:* Coey (3). *Goals from touchdowns:* Geist, 2. *Umpire:* Mason, Harvard. *Referee:* Chapman, Harvard. *Linesmen:* Redding, '06; Peabody, '07. *Time:* 25-minute halves.

THE RELAY RACE

The relay race was run off between the halves of the football game. Except for snow on the north turn of the track, conditions were as good as could be expected. The high wind which prevailed at the beginning of the games had fallen.

At the start '06 obtained the lead, which they held and increased throughout the race, winning by 55 yards. Distance, 2 miles; number of laps, 10. Time, 7 m. flat.

Following are the names of the men and the order in which they ran: —

1906.— Howe, Moffat, White, Englis, Libbey, Guernsey, Captain Mann, Guest, Coe, Wilson.

1907.— Barrows, Willcomb, Luther, Richards, Thomas, Captain E. P. Noyes, Conover, Gould, E. C. Noyes, Wilson.

THE TUG-OF-WAR

After the football game the tug-of-war was run off. The men of 1906 showed the greater power from the start, and in 21 seconds won the event. The following is the line-up of the teams: —

1906.— J. W. Johnson, Rowell, Hobson, Terrell, Lawrence, Wetterer, W. J. Walker, Bentley, Young, Emery, Ranch, Wright, Ross, Tripp, Hallowell, Captain Fallon, Sherman, Polhemus, Farwell, Kane, Coes, Sheldon, Carruth, Stanton, and Hursh, anchor.

1907.— Whittemore, McLoud, Davis, Barker, Landers, Hamilton, Marsh, Freedman, Hukill, Zuest, Hall, Parlin, Hampton, Gordon, Banfield, Rehn, Jackard, Hallett, Crowhurst, Pope, Monahan, Miller, Captain Hudson, Wonson, and Hinckley, anchor.

THE FALL GAMES

Following is a summary of the events in the games of the fall of 1903: —

75-YARD DASH.— First heat: first, W. B. Boggs, '04 (3 yds.); second, H. B. Conover, '07 (7 yds.). Time, 8 1–5 s. Second heat: first, R. Howe, '06 (6 yds.); second, C. R. Haynes, '04

(3 yds.). Time, 8 2–5 s. Third heat: first, J. W. Williams, '06 (4 yds.); second, L. B. Turner, '05 (3 yds.). Time, 8 1–5 s. Fourth heat: first, M. A. Coe, '06 (5 yds.); second, K. W. Richards, '07 (5 yds.). Time, 8 2–5 s. Fifth heat: first, A. Fisher, '05 (6 yds.); second, F. G. Baldwin, '06 (6 yds.). Time, 8 1–5 s. Sixth heat: first, A. C. Dickerman, '05 (7 yds.); second, G. S. Gould, '07 (6 yds.). Time, 8 1–5 s.

First heat, semi-finals: first, H. B. Conover, '07 (7 yds.); second, W. B. Boggs, '04 (3 yds.). Time, 8 1–5 s. Second heat, semi-finals: first, A. Fisher, '05 (6 yds.); second, K. W. Richards, '07 (5 yds.). Time, 8 2–5 s. Third heat, semi-finals: first, A. C. Dickerman, '05 (7 yds.). Time, 8 1–5 s.

First heat, finals: W. B. Boggs, '04 (3 yds.). Time, 8 1–5 s. Second heat, finals: A. Fisher, '05 (6 yds.). Time, 8 1–5 s.

440-Yard Dash.— First, J. J. Thomas, '07 (20 yds.); second, M. A. Coe, '06 (16 yds.); third, R. Howe, '06 (19 yds.). Time, 54 4–5 s.

880-Yard Run.— First, E. L. Wilson, '06 (scratch); second, C. R. Boggs, '05 (16 yds.); third, M. A. Coe, '06 (20 yds.). Time, 2 m. 11 4–5 s.

1-Mile Run.— First, G. D'W. Marcy, '05 (40 yds.); second, P. W. Horton, '04 (50 yds.); third, E. H. Lorenz, '05 (45 yds.). Time, 4 m. 54 4–5 s.

2-Mile Run. First, E. H. Lorenz, '05 (scratch); second, D. Adams, '05 (60 yds.); third, B. B. Holmes, '07 (110 yds.). Time, 11 m. 1 3–5 s.

80-Yard High Hurdles.— First heat: first, C. R. Haynes, '04 (scratch); second, R. D. Emerson, '05 (scratch). Time, 11 1–5 s. Second heat: first, R. D. Farrington, '05 (5 yds.); second, E. P. Noyes, '07 (4 yds.). Time, 11 s. First final heat: R. D. Farrington, '07 (5 yds.); second, E. P. Noyes, '07 (4 yds.); third, C. R. Haynes, '04 (scratch). Time, 10 4–5 s.

80-Yard Low Hurdles.— First heat won by J. W. Santry, '06 (6 yds.). Time, 9 4–5 s. Second heat won by G. A. Curtis, '04 (5 yds.). Time, 9 4–5 s. Third heat, tie between R. D. Farrington, '05 (4 yds.), G. D. Luther, '07 (5 yds.). Time, 10 s. Heat

for second men, E. B. Snow, '05 (6 yds.). Time, 9 3–5 s. Final first heat: E. B. Snow, '05 (6 yds.); second, G. A. Curtis, '04 (5 yds.); third, J. W. Santry, '06 (6 yds.). Time, 9 3–5 s.

Running High Jump.— First, R. D. Farrington, '06 (scratch), 5 ft. 9¼ in.; second, F. W. Barrows, '07 (6 in.), 5 ft. 7 in.; third, G. A. Curtis, '04 (scratch), 5 ft. 6¼ in.

Running Broad Jump.— First, G. D. Luther, '07 (11 in). Distance, 19 ft. 10 in. Second, D. K. Keller, '04 (1 ft. 3 in.). Distance, 19 ft. 7 in. Third, C. Hoy, '06 (1 ft. 6 in.). Distance, 19 ft.

Pole Vault.— First tie between C. R. Burleigh, '06 (2 ft.), and H. P. Farrington, '07 (2 ft.). Distance, 10 ft. 6 in. H. G. McVay, '07, 1 ft. 8 in., 10 ft. 2 in. Farrington won on toss.

Putting 16-Pound Shot.— First, D. C. Schonthal, '05 (1 ft. 8 in.), 36 ft. 1 in.; second, J. C. Baker, '04 (1 ft.), 35 ft. 9 in.; third, V. H. Paquet, '05 (3 ft.), 35 ft. 3 in.

Hare and Hounds Chase.— The first run, October 24, at Wellesley Farms was well attended, notwithstanding the fact that both the Freshman and Sophomore football teams played games. Tsuruta, '05, was the first hound to finish. Time, 1 h. 20 m.

DINNERS AND RECEPTIONS

Y. M. C. A. RECEPTION

The reception tendered to the Freshman Class by the Y. M. C. A. of the Institute at Tech Union Friday evening, October 2, was the most successful ever undertaken. About two hundred and twenty-five persons were present, among them a large number of the instructing staff and upper class men.

President Bartlett welcomed the guests, and extended the hospitalities in behalf of the Association. He introduced President Pritchett, who made a very characteristic speech, in which he urged the men to make each other's acquaintance, and not to be slow in availing themselves of the opportunities offered. Further, he explained the purpose of the Union, its meetings, dinners, and other social features. Lastly, he dwelt on the importance of the art of

conversation, and advised all to cultivate this true accomplishment. Dr. Pritchett was followed by Hadley, '04, who explained to the Freshmen what work and fun meant at the Institute. Dr. McElveen was the next speaker. He urged the men to attend their church regularly, and in behalf of his fellow-clergymen he extended a very cordial welcome. Professor Dwight Porter closed the evening's addresses by explaining the work of the Association at Tech.

After refreshments the men gathered round the piano, and spent the rest of the evening singing from the new song-book.

MRS. PRITCHETT'S RECEPTIONS

Mrs. Pritchett held the first of her afternoons for students on November 14. Each Tuesday and Saturday she is at home to Tech students from five to half-past six at her home at 147 Bay State Road.

A WELCOME TO PRESIDENT PRITCHETT

On the evening of President Pritchett's return from Europe a large number of undergraduates met at the gymnasium to give him a welcome home. The gathering, between four and five hundred strong, formed in column by classes, and marched out Newbury Street to Massachusetts Avenue, and thence to President Pritchett's residence on Bay State Road. When the house was reached, an M. I. T. cheer, with three "Pritchetts," was given. Another followed, with three "Welcomes" at the end. President Pritchett then came out on the steps, and was greeted with long cheers. Dr. Pritchett expressed his gratification at being at home, and characterized the welcome from the students as the best part of the home-coming. He then asked the whole gathering to come in. This invitation was warmly seconded by Mrs. Pritchett, and so a line was formed and every one had a chance to shake hands with President Pritchett and to welcome him individually. Light refreshments were served to each man as he passed through, and after a short time the entire company had reassembled on the steps.

The party marched back down Commonwealth Avenue to Rogers steps, gave class yells, and an M. I. T. cheer, with three for Dr. Pritchett.

RECEPTION TO GRADUATE STUDENTS

The graduate students were entertained October 23 by the Dean and Advisory Staff of the Institute at the Technology Club. Over one hundred and fifty graduates of other colleges were present; and nearly every State in the Union was represented, besides at least three foreign countries. The Dean, in one of his characteristic speeches, extended to the students a most cordial welcome to Tech. James P. Munroe, '82, president of the club, then welcomed all to the club.

The house, with all its privileges, was thrown open to the guests; and the evening terminated with a supper served in the club dining-room.

FRESHMAN DINNER

A dinner for the Freshman Class was given October 14 at the Union by the House Committee. The dinner was for the purpose of getting the men into the habit of using the rooms and of arousing interest in Tech affairs in the new men. Norman Lombard, '05, presided. R. A. Wentworth, '04, G. B. Perkins, '05, William Green, '05, and others addressed the men in the interest of the Tech Show, the *Tech*, *Technique*, Athletics, and other student activities.

The record for numbers was broken, two hundred Freshmen sitting down to dinner, while nearly a hundred were turned away for lack of room. The largest previous number ever entertained at the Union was one hundred and ten.

THE FIELD-DAY DINNER

The annual dinner given by the Advisory Council to the participants in field day was held at the Union on December 1, one hundred and sixteen plates being laid. Besides the teams of both

classes, the judges and the marshals, Dr. Pritchett, Dean Burton, Mr. Rand, the Advisory Council, Mr. Bullard, and others interested in Tech work were present to help make the evening joyful.

NOTES

Mr. C. S. Pierce, the eminent scientific investigator, gave a very interesting talk on the "Relation of the Sciences" at the Technology Club December 14. Graduate students and others interested were invited, and the large room of the club was completely filled. Mr. Pierce first spoke of mathematics as being a branch of science necessary to all the others. From a sketch of some of the less understood mathematical subjects he led on to the history of some of our most important manuscripts, and, finally, to an analysis of the methods of inductive reasoning.

The second debate in Professor Pearson's course took place Wednesday, November 25. The debate was on the following question: —

Resolved, That it is for the interest of the Institute to abolish all final June examinations of the Senior year.

Messrs. Edmunds, Simonds, and Schwartz were on the affirmative; while Messrs. Drew, Parker, and Keller took the negative.

Mr. John F. Mahan, director of athletics, under instructions of the Advisory Council, has obtained over six hundred bushels of arc cinders, and placed them on the tracks at the Tech Oval.

THE GRADUATES

ANNUAL MEETING OF THE M. I. T. ALUMNI ASSOCIATION

Alumni to the number of about two hundred gathered at the Hotel Brunswick, December 21, for their annual meeting.

The following reports were received: report of the Executive Committee, financial report of the secretary, report of the Walker Memorial Committee, report of the Committee on the School, report of the trustees of the Alumni and Life Membership Funds, report of the Advisory Committee on Athletics, report of the Committee on the William Barton Rogers Scholarship Fund.

Following is the report of the Committee on the school: —

Your Committee note with pleasure the constant broadening of the work of the school, the increased improvement in the methods of instruction and the natural result which such methods bring about, an increase in the number of students and the graduation of men better fitted for the work they are to take up. . . .

The past year has been one of the most successful years of the school, some 1,608 students being on the roll, and at the close of the year 193 students graduated, bringing the grand total of graduates up to 2,710. . . .

Although for many years not connected with the Institute, the death of Professor Henck, which occurred since our last meeting, should not pass without a word. Professor Henck was active in the work leading to the founding of the Institute. He established the course of civil engineering and was its professor until 1881, and he was one of that group of founders of the Institute whose sturdy characters and devoted work did so much to place it in its present high condition.

Practically, every department has been benefited during the past year by increased facilities, apparatus, etc.

A new brick building, 165 × 58, three stories in height, has been erected on Stanhope Street at an expense of about $40,000, in which has been placed the entire department of Naval Architecture, Physico-Chemical Engineering, and Mineralogical Analysis, relieving very much some of the overcrowded buildings. While built at a very small cost, considering the

accommodation obtained, and with little attempt at ornamentation, it is, nevertheless, an attractive building in appearance and especially well suited to the purpose. The full design of the building was not carried out, a portion being left to be added, if desired later, and the building, like the Lowell building, is to be considered as temporary.

Expecting an early removal of the Institute, Engineering C, as it is called, was located upon ground set apart for the Walker Memorial Gymnasium ; but, should the Institute remain in its present location, the Alumni are assured that a site equally satisfactory will be provided.

By the gift of a sum of money to be devoted to the study of sewage problems, the Institute has been enabled to lease the property at 786 Albany Street (a site selected because of its advantageous location upon the line of discharge of the main sewer of the city), and has established here an experimental station and laboratory for the study of the methods of sewage purification and disposal. On the property are two wooden buildings, one of which has been fitted up with chemical and bacteriological laboratories, the other with a complete system of tanks where processes of sewage treatment can be practically tested.

The tuition fee, beginning with the class entering in 1903, has been increased from $200 to $250 per annum,— an annual fee higher, we believe, than that charged by any of the colleges or institutions of the country of a similiar nature. This is one of the most important happenings of the year,— important because it at once reduces the number of entering students to a number below those who would have entered, and so affects the number of graduates ; and important because it places an Institute education still farther away from that class of men who, because of slender means, are driven to greater exertion and urged to habits of harder and more continuous work, resulting in greater accomplishments than those of their more fortunate fellows.

The last previous increase in tuition was in 1874, when it was increased from $150 to $200 and applied to all students on the roll. Doubtless other factors influenced the number of graduates, but it is a noticeable fact that the number of graduates, which in 1876 had reached 42, dropped to as low a point as 8 in 1880 ; and it was not until 1886 that the record of 1876 was passed, the *total* number of students on the roll followed substantially the same curve.

The total number of students on the roll 1902–03 was 1,608, on the roll 1903–04 is 1,566. Entering in 1902, 479 ; and in 1903, 327. As the number entering in 1902 did not show a large excess over 1901, it would not

appear as if the early notice of the increase of tuition perceptibly affected the result, but that the decrease in the entering class of this year is due to increase of tuition combined with an increase of requirements and the general business depression.

It is to be regretted that the necessity for this arose ; but the attention of the Alumni is particularly called to the annual report of the Treasurer, which shows a deficit of over $36,000, and this, too, in spite of the increase in students' fees, amounting to about $33,000. It is to be borne in mind that a technical education such as is given at the Institute is given with the aid of expensively equipped and maintained laboratories, and the tuition must be high if it is to even approximate the cost of the students' education.

The Alumni are unable to give substantial sums to the Institute ; and we have the peculiar spectacle of the leading technical school in the world struggling to meet expenses, while many other schools and colleges are having millions lavished upon them. The Institute is comparatively poorly endowed ; and much of its trust funds is devoted to scholarships, which, while of benefit to the student, are, for the reason stated, a drain upon the other funds of the Institute,— a fact which might be kept in mind by the Alumni and their friends who desire to aid in the work of the Institute. It is believed that an endowment of at least a million dollars is needed at once ; and there is no doubt that the income from an endowment of five million dollars would be none too large for the proper carrying on of the work of the Institute.

The Commonwealth of Massachusetts has released to the Massachusetts Institute of Technology, its successors and assigns, all its right, title, and interest in the westerly two-thirds of the square between Newbury, Boylston, Berkeley, and Clarendon Streets on the Back Bay in the city of Boston. . . .

Plans have been made for a new building on Newbury Street between Rogers and Walker ; but its construction has not been begun, as the Boston Society of Natural History has brought a bill in equity to perpetually restrain the Massachusetts Institute of Technology from erecting the building. This may be argued this winter. . . .

Radical changes have been made this year in the method of instruction used in the department of drawing, embracing therein the subjects of mechanical and free-hand drawing and descriptive geometry. Whatever the final decision as to the value of the methods adopted, a spirit of genuine enthusiasm and interest in these subjects has been aroused in the students, and the future promises well.

Instead of the old method of devoting substantially the entire allotted time

to the preparation of plates in the drawing-room, two hours a week are devoted to lectures, at which the instructor discusses his subject at the blackboard or by diagram, the students taking notes, which are afterwards worked up in the drawing-room within a specified time. No text-book is used, but the instruction is followed up by printed notes for purposes of reference; and the student is thus trained not only in making quick pencil sketches and in mechanical drawing, but is familiarized with the fundamental principles of descriptive geometry, so much dreaded by the average student, before he realizes it.

Preparations for the Institute Exhibit at the St. Louis Fair are well under way. One thousand square feet of floor area have been awarded to the Institute, and the exhibit promises to be a comprehensive and most interesting one. Large photographs illustrative of the work at Technology, drawings and designs by students in the various departments, and plans of more important work done by graduates will decorate the walls of the exhibit room, while the cases will be filled with descriptions and examples of the work of the different departments, notes, lectures, models, drawings, catalogues, etc.

We are glad to note the continued evidences of hearty co-operation between departments, so essential to the success of the school, which is unfortunately sometimes lost with the rapid growth in plant of institutions of learning as well as business concerns. Thus the new electrical engineering department is co-operating with the mechanical engineering department in having its students make electrical tests under its direction upon dynamos, motors, etc., simultaneously with the mechanical tests made by the students under the direction of the mechanical engineering department upon the boiler and engine plant.

In a similar way the English department is co-operating with the various engineering departments, and many other examples might be cited.

The Institute is to-day facing problems of great importance to its welfare, as the problem of removal; but the Committee feel sure that the Alumni will be given opportunity to pass judgment upon them before definite action is taken.

Mr. Prichard and Mr. Taintor, a majority of this Committee, call the attention of the Alumni to the excellence of the Technology Review, in spite of the diffidence of the third member of this Committee, who is also upon the editional board of the Review. In our opinion, all Institute men have reason to feel proud of this publication, not only on account of the high standard of the work itself, but also on account of the scientific and general interest of the articles therein.

It is our opinion that the continuance of this publication on its present high

plane of excellence will play no mean part in increasing the influence of the Massachusetts Institute of Technology.

Respectfully submitted,

(Signed) CHARLES F. PRICHARD.
GILES TAINTOR.
LEONARD METCALF.

The Nominating Committee reported the following nominations for officers, all of whom were elected: for president, Samuel J. Mixter, '75; for vice-president, Alexander Rice McKim, '86; for secretary, Arthur G. Robbins, '86; for members of the Executive Committee, Harvey S. Chase, '83, Edw. G. Thomas, '87; for member of Alumni Committee on the School, George E. Hale, '90; for trustee of the Alumni Fund, Walter H. Kilham, '89; for members of Committee on Associate Membership, Harry W. Tyler, '84, John A. Collins, Jr., '97; for member of Advisory Committee on Athletics, Frank H. Briggs, '81.

The Executive Committee was authorized to report at the next annual meeting on the feasibility of holding the annual meeting in June.

On motion of Professor Johnston, '92, it was: —

Voted, first, That present and past secretaries of the Alumni Association be made life members of the Association in recognition of faithful and loyal services rendered, also that they be considered guests at all functions held under the auspices of the Alumni Association.

Second, That future secretaries of this Association be granted the same privileges as above after serving two years.

The trustees of the Life Membership Fund were authorized to return the life membership fee to the secretary, who was already a life member.

Frederick H. Newell, of Washington, D.C., president of the Association, presided as toastmaster at the after-dinner exercises; and the guests were President Pritchett and Edgar Van Etten, second vice-president of the New York Central & Hudson River Railroad.

President Pritchett said, in part: —

Three years have now elapsed since I began to meet with you in these semi-annual gatherings, and I am sure that my talks must already seem to you very monotonous. I fear they can be interesting only to alumni who have unusual devotion. I have sometimes envied, as we sat together on such occasions, college presidents who have come of the institutions over which they presided, — men like President Hadley, of Yale, who has been a part of Yale University almost since his birth. There must be a great satisfaction in directing such a work when one has grown up in the traditions which cling about it.

Nevertheless, he who comes to so great a work from the outside cannot fail to be drawn to it by the strongest ties; and, while he may not share as thoroughly its traditions, he has, perhaps, certain advantages in looking at it from a standpoint a little more removed.

During these three years those in control of the Institute have been working along three lines of general policy. First of all has been the effort to improve the means of instruction, to minister to the intellectual and the moral growth, and to adapt the work to new conditions, while keeping hold of the old spirit. In these days one sometimes gets the impression, I fear, that the first duty of a college president is to get money. It is worth while to remind ourselves at these gatherings that no endowment, no material equipment, can take the place of an alert, intelligent spirit and a healthy moral tone in the student body, or fill the places of high-minded, sympathetic, scholarly men in the Faculty.

In the second place it has been the policy of the administrative board of the Institute during these three years to expend its resources generously in order to provide facilities equal to the best. The department of electrical engineering and its splendid new laboratories, the new building which houses the department of naval architecture and the laboratory of chemical research, the establishment of a graduate school of engineering research, are all steps taken, not by reason of additional endowment, but without it, and in the faith that the Institute of Technology must occupy a foremost place in technical education.

A third effort, and one vitally connected with the wish to bring to the Institute new men and to improve our facilities, has been the effort to increase the income. Our income has grown in three years from $347,132 in 1900 to $436,808 in 1903, — an increase of nearly ninety thousand dollars, equivalent to the interest on something like two and a quarter mill-

ions of dollars. This income has come almost entirely from the increase in student fees due to the greater number of students. Our expenses in the mean time have grown faster than our income, so that the deficit of the last year is larger than for some years past, and serves to emphasize the fact that in technical education increase of expense keeps pace with increase in numbers, and that such education, in the best sense, can be kept up permanently only by a generous grant from the State or by a correspondingly large income from private endowment. Where the Institute of Technology is to find this endowment is one of the serious problems. The reasons which impel men of large fortunes to give their money to institutions of learning are varied. Few such gifts have come to the Institute, but I can scarcely believe that any man interested in the industrial progress of America could find a more fruitful field for his money than that which the Institute offers. You alumni may serve your Alma Mater by calling attention to this fact.

During the past year the Institute has been brought into prominence within the State by the petition of the Corporation asking a title to the land upon which the Rogers and Walker Buildings stand. The outcome of that action, the deed from the State to the Institute of its rights, and the suit brought to test the value of that act are doubtless known to you all. I wish to refer for the moment only to one phase of the discussion which took place concerning it, and that is to the moral attitude of the Institute in this action.

The Executive Committee, after a careful consideration of the original act under which the use of this land was granted, felt convinced that the State had explicitly reserved the right to use this land for the purposes of the Institute. It was, in their judgment, a question merely as to when the State should exercise that right; and their action in asking for the exercise of this right on the part of the State was taken with due regard to the interests of all others involved.

The effort to secure a title to the land on Boylston Street inevitably involved the whole question of a possible removal of the Institute, since it would have been unfair to ask for such a title without a full statement of what it might involve; and this problem of a possible new site has given rise to much questioning and to many rumors amongst the alumni and amongst friends of the Institute. In regard to all these, let me say just one word. The gift of this land, if the title is finally confirmed, offers to us two methods of relieving our overcrowded condition for some years to come,— one by building over the unoccupied land, and the second by the possible sale of the land and removal to a new site.

With regard to these alternatives, let me say that nothing is going to be done in a hurry. There is no definite plan before the Executive Committee, and there can be none until the question of the title to the land is settled. Meantime I hope that the alumni, who are surely as much interested in the future of the Institute as any others, may understand that before any final steps are taken in a question so closely affecting the future of the Institute they will have an opportunity to be heard. They will be taken into the counsels of the Corporation. Of one thing be sure: the Institute of Technology has earned a real place in American education in its forty years of history. Whether it abide another quarter-century in its old home or whether it begin the new century in a new home, the Institute is going forward, not backward: it is going to hold on to the old ideas of faithfulness and of work, and it is going to deal at the same time with the new problems which a new century sets before it; and whether this effort be carried on in one place or another, whether the problems which come before it are complicated or simple, whether it receives great gifts of money or not, those who are trying to lead it will hope to deserve your confidence no less than your support.

Mr. Van Etten refrained from discussing the technique of railroad administration, but chose rather to tell of the attitude of the public toward the great public service corporations from the standpoint of their managers and directors. He said, in part: —

We hear a great deal from our citizens and read much more in the press about the duty of railroads to the public, but I have yet to see an article on the duty of the public to the railroads. But what constitutes a railroad company, so far as the public is concerned? It is a band of individuals incorporated into a body having certain individual responsibilities, as well as responsibilities which concern it collectively, and is given certain rights collectively which are not given to individuals. The most important of these rights is the right of eminent domain, which usually is the privilege of buying property at a price about double what the individual would have to pay.

When the public demand anything of a railroad company, to whom do they go? Perhaps an illustration may be pertinent. The Boston & Albany Railroad has a capital of $25,000,000. This is held by 8,401 stockholders, 7,104 of whom reside in Massachusetts and represent about $21,500,000 of the capital. Now these people own that road just as much as any individual owns his house or his business, notwithstanding the fact that about 4,630

of the Massachusetts stockholders own ten shares or less each. Therefore, the Boston & Albany Railroad is a combination of Massachusetts citizens ; and every hostile or unreasonable move against the railroad is a move against the citizens and the public of Massachusetts.

There are many ways in which the patrons of a railroad can assist the management, the owners, and, consequently, the public. The operating officers of all railroads are constantly urged to make better time with local trains. Investigations show that the trains make fast enough time between stations. The same investigations disclose the fact that the reason trains remain so long at stations is because passengers do not move quickly in leaving the trains. We find no fault with this ; but why should the public find fault with us, when the remedy is in their own hands ? The public can save thirty seconds at each stop if they will, and with a train making twenty stops this means ten minutes.

Many profess to be complaining in the interests of some community ; but, when you begin to made inquiries, you find that the real meat of the complaint is an individual selfish motive. If the individual public would cease being selfish, the general public would be as well or better served and a great deal of friction avoided.

Now does not the public owe it to the public service corporation to see that the latter is treated fairly ? The Boston & Albany Railroad paid more than $545,000 in taxes last year,— about 5½ per cent. of its earnings, by the way ; and should it not have the same consideration that other tax-payers receive ? That is all it asks, and the public should see that it gets it.

In a recent speech Mr. Carroll D. Wright advocated that railroads should pension all employees, and in this all railroad officials will agree. I am almost certain you will see it on the New York Central system erelong. Mr. Wright also recommends that a sinking fund should be established, or a certain sum set aside annually for the purpose. This is all right, too ; but how is it to be accomplished in the cases of railroads which are now only able to keep up a decent maintenance, and cannot earn more than enough to pay actual running expenses and interest ? You now have a personal liability law in this State, and your law-makers are undoubtedly able to make and maintain laws which will compel public service corporations to pay pensions to employees, their widows and children ; but I maintain that, having granted a public franchise under the then existing conditions, the law-making power has no moral right to add burdens which were not contemplated when the franchise was granted, unless it also provides that the earning

power of the corporation may be so increased as to cover the unlooked for expense.

A railroad has nothing to sell, from which it derives revenue, excepting transportation; and in its endeavors to induce people to purchase this commodity it engages the best talent at both its passenger and its freight bargain counters. Some of the best talent in the world is engaged in the various departments of the several railroads. Almost without exception they are fair-minded, sensible men. Were they engaged in other business than railroading, their advice and opinions would be sought eagerly; but, being in the railroad business, it is a foregone conclusion, of course, that they are in a business that any man, woman, or child possibly, can successfully (so they believe) advise them about. Is it asking too much of the public that they treat the railroad official and the railroad as they would treat any other business man or any other business?

Other speakers were the president-elect, Dr. Samuel J. Mixter, of the Alumni Association, and William H. Niles, Professor Emeritus of Geology.

ARTHUR G. ROBBINS, '86, *Secretary*,
Mass. Inst. of Technology.

THE NORTH-WESTERN ASSOCIATION OF THE M. I. T.

[Extracts from the *Bulletin*]

An array of talent such as is seldom seen even at a N. W. A. M. I. T. dinner will be on hand Tuesday, Oct. 27, 1903, at the new college room of the Sherman House, corner Randolph and Clark Streets.

(1) George Ade, famous in slang, opera, plays, etc.

(2) John T. McCutcheon, cartoonist, in a class by himself.

(3) Radium, the new and wonderful discovery, will be exhibited and discoursed upon by Mr. N. E. Goldberg, representing H. Lieber & Co. of New York, who will have a full exhibition of samples and stunts. We also hope to have a famous professor of physics with us to hand out all the latest in sub-atomic theories as shown by radium and other radio-active substances. The radium samples will be in the form of bromides.

You won't have another such opportunity as the next meeting

promises for a long time to come. This programme is to celebrate our first reunion after our vacations, and we want at least one hundred men to turn out.

Don't forget by-law No. 13. The man who wears a dress suit or Tuxedo at a regular meeting will be fined $1 and costs. The treasurer will see that it is collected on the spot.

The Sherman House college room has shields of the different colleges arranged around the room. Sturm, '96, was architect for the place, and worked in two Tech shields. Bully for Sturm! . . .

The next meeting will be the last before the annual, which will be Saturday, February 20. Now we want even a bigger crowd than the seventy men which turned out the last time. The meeting will be Tuesday, December 15, at 6.30 P.M., at Hamilton Club, corner Clark and Monroe Streets. We all remember what a jolly good time we had there the first meeting of the year, and now we will wind up the year at the same place. The charge will be only $1.25 per plate. You are privileged to bring guests this time.

The subject will be a most up-to-date one. With the car-barn murderers caught, as well as numerous other criminal subjects attracting great attention, we will be more than drawn by Dr. G. Frank Lydston, ex-major U. S. V., on Criminology, illustrated with magic lantern slides.

Then our old friend Assistant Chief of Police Schuettler will be present; and just think of the stories he can and will tell us!

But a detective meeting without the modern Sherlock Holmes in the person of the Pinkerton Agency would be imperfect. So we are counting on Mr. Nat Pinkerton, who will be there unless out of town.

VAN RENSSELAER LANSINGH, '98, *Secretary*,
18 E. Adams Street, Chicago, Ill.

THE TECHNOLOGY CLUB OF NEW YORK

The "Tech spirit" in this city is being cultivated rapidly by means of the new club-house which opened in September, 1903. A new interest is aroused among the men, which bids fair to increase greatly. From a membership of one hundred and twenty, one year ago, we have jumped to two hundred, which number will be two hundred and fifty before spring. We are desirous of securing every man in Greater New York. Any information regarding the club will be furnished gladly by the secretary.

The meeting on the 10th of November was attended by about forty men. There were no special features arranged, but liberty was allowed each man for a good time. Light refreshments were served. Various methods and means were considered for furnishing more fully the club rooms.

The meeting on the 10th of December was attended by about one hundred and seventy-five men. This included members and guests. Previous to the evening's entertainment about thirty fellows took dinner at the Park Avenue Hotel. They reported a very agreeable repast. The pleasure of the evening was given to the club by Mr. Peter Cooper-Hewitt, who demonstrated and described his vapor-mercury light. He was ably assisted by Mr. Thomas, '93. A vote of thanks was unanimously extended to Mr. Cooper-Hewitt for the profitable and interesting evening. A business meeting was held afterwards. The constitution for the club was then presented. After the usual debate and considerations it was adopted by a unanimous vote. From its provisions five men for board of governors of the club by ballot were necessary. The following men for this board were elected: Alex. Rice McKim, '85; C. W. Aiken, '91; C. B. Pollock, '94; R. S. Allyn, '98; C. R. Place, '02. This board had its first meeting at the club-house Dec. 19, 1903. Its first business was the election of officers for the club. The following men were chosen by the board: —

Alexander Rice McKim, '85, president; C. R. Place, '02, secretary; C. B. Pollock, '94, treasurer; R. S. Allyn, '98, chairman

of House Committee; C. W. Aiken, '91, vice-chairman of Entertainment Committee.

Various features regarding the club, its maintenance, and its future work, were discussed. The board then adjourned. We are looking forward to a very successful 1904 year, and ask every Tech man to help make it so.

C. R. PLACE, '02, *Secretary*,
36 East 28th Street.

THE WASHINGTON SOCIETY OF THE M. I. T.

President Pritchett honored our fifth annual banquet at the Teacup Inn on December 7, and he stirred up enough enthusiasm among the forty men present to insure the prosperity of our society for the next year. Dr. Pritchett spoke at some length of his trip to Germany and his studies of the educational systems of that old country, and contrasted them with our own. He remarked especially on the frankness and candor of the German, of his ability to recognize the worth in others and his own deficiencies, and his promptitude in taking advantage of the clew and accepting the benefit of it. This is a feature that is worthy of consideration by all Technology men. In some things we will have to improve to catch up with the Vaterland; and in others, as our electrical equipments, we are at present considerably in the lead. It was very interesting to hear how much the emperor has helped the technical schools to become what they are, how he personally visits them and watches the progress they make. What a help it would be if our own Chief Executive could devote more of his time likewise! Dr. Pritchett delighted us by his graphic description of his ride on the new high-speed German electric railroad which runs between Berlin and Zossen. It is interesting to note that he had to get the Deutsche Bank to secure him against any possible damages from accident before taking the ride. This road is perhaps the most striking instance of German progressiveness, it having been erected at a cost of a million dollars, subscribed by the great German manufacturing companies solely as a practical experiment in railroad operation.

Another of the Technology men present of whom we are proud is Mr. Butler Ames, '96. He is now an Honorable and a big man, but just as genial as ever, although he might well be allowed to stiffen up a little, since he is the first Institute man to go to Congress. He says that it is his business to be polite, but we know the real truth is that it is his own good fellowship. Such cordiality cannot be made to order, even in Congressmen.

Assistant Secretary Armstrong of the Treasury we had with us also, and were much pleased to hear his remarks on the calibre of the Technology men who are under his authority in the department. His word for them is "thoroughness." Mr. Armstrong is another one of the young men at the helm in the service of the government who has won his high position by conspicuous ability.

At the business meeting we elected for our president Mr. Proctor L. Dougherty, for vice-president Mr. Winthrop Cole, for treasurer Mr. William J. Rich, all of whom held the same offices last year. For secretary we elected Mr. M. O. Leighton, whose address is the Geological Survey, and for fifth member of the Executive Committee Mr. C. C. Babb.

This last year has been a very prosperous one for our society, and it has forged ahead into more prominence than ever before. It has been the policy of the Executive Committee to meet twice a month, and this rule has been substantially followed during the year with very beneficial results. Perhaps the most important venture that we have made is the inauguration of a University Club movement in this city. We have found our want of a home to be a need that is becoming more and more serious as time goes on. Like all the other college alumni associations here, we are obliged to resort to the various hotels and other public meeting places; but these, always more or less unsatisfactory at best, have steadily increased their charges to such an extent as to be almost prohibitive for our smoker purposes. Preliminary notices were sent out to all the college alumni associations in the city, requesting each to send a delegate to form a temporary committee to determine the sentiment of the various college alumni associations as regards the formation of a University Club in this city. A meet-

ing of men from Technology, Harvard, North-western, University of Pennsylvania, and Cornell, was held at the Marlborough on July 18; and Mr. Dougherty was appointed chairman and Mr. Nathan secretary of the committee, and the following resolution was adopted: —

That this committee resolves that the Washington Society of the Massachusetts Institute of Technology send out requests to the presidents of the various college organizations to appoint two representatives to form a permanent central committee to discuss the advisability and practicability of forming a University Club, and to initiate steps toward the formation of such.

Our society appointed Mr. P. L. Dougherty and Mr. H. A. Pressey as delegates, and they met the others at the first session of the Permanent Committee at the Cosmos Club. Mr. Dougherty was chosen chairman of the Permanent Committee, and other steps were taken towards a serious consideration of the project. The delegates were enthusiastic about the project, and it appears certain to become a success. One of the main features of the organization will be the provision of suitable quarters for the college alumni meetings, the advantages of which are self-evident.

An enjoyable smoker was held last May at the Octagon House, when we had the pleasure of meeting Professor Duncan, who entertained the members with stories and the latest news of Technology. Dr. Duncan comes from Annapolis, and found at our meeting two other Annapolis-Technology men, Mr. Frank C. Skinner and Mr. Sidney F. Smith.

Dr. Pritchett lunched with President Roosevelt at the White House at the time of his last visit in this city.

ALBERT F. NATHAN, Jr., '99, *Secretary*,
U.S. Patent Office.

ASSOCIATION OF CLASS SECRETARIES OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The seventh annual meeting of the Association of Class Secretaries was held at the Technology Club on the evening of Thursday, Nov. 19, 1903, twenty-eight members being present. The dinner, which was served at seven o'clock, was followed by the business meeting, at which Mr. E. C. Miller, '79, presided.

The report of the Committee on Publication of the REVIEW was presented by Mr. Munroe, and showed the condition of the magazine to be prosperous and satisfactory. Steady gains have been made in the receipts from subscriptions and from advertising, while the cost of publication has been lowered, so that during the year the REVIEW has paid its way, without subsidy from the Institute, and is able to begin the new year with a comfortable balance for emergencies. The most encouraging fact, however, is the very significant one that, while the percentage of subscribers to Volume III. who renewed their subscriptions was 87+ (itself a remarkable figure), the percentage of subscribers to Volume IV. who renewed was nearly 90. Such support as this betokens, it is believed, two things,—the great loyalty of Institute men and the fact that the REVIEW is worth encouraging. In addition to these paid subscriptions the REVIEW has furnished to libraries, colleges, preparatory schools, etc., at its own cost, nearly four hundred and fifty copies of each number; and sample copies have been sent to the graduating class and to the parents of the Freshmen. And in the four numbers for 1903 there have appeared five hundred and forty-five pages of reading matter, nine more pages than in Volume IV., which was itself larger than any of its predecessors.

The report of the Committee on Closer Relations among Graduate Organizations was presented by Mr. C. F. Read, '74, chairman, and accepted as a report of progress. The committee consists of the assistant secretary of this Association (chairman) and the secretaries of the Alumni Association and the Faculty, all as permanent members, with the secretaries of the Technology Club of New York and of the Northwestern Association of Chicago as mem-

bers for the current year. It was voted unanimously "that this meeting heartily approves the action of the Committee on Closer Relations in its efforts to secure uniformity of name among the local graduate organizations, and believes that, wherever possible, the adoption of the name 'Technology Club of —— ——' (stating locality) is desirable."

Dr. Noyes, '86, in reporting for the Committee on Vital Statistics, stated that the collection of information as to marriages and offspring of former students would be undertaken by the Institute in the name and with the approval of the individual class secretaries, but without expense to the classes.

The subject of the alumni observance of commencement was brought up by a letter from the class of '93, suggesting: —

1. That each class establish headquarters at or near the Institute on the afternoon of commencement day, making this a meeting-place both for members of the class and for their friends from other classes.

2. That each class make the date of its annual dinner at or near commencement.

The meeting voted unanimously to indorse the propositions of the class of '93; and, in order to carry them into effect, the following committee was appointed, with full powers: the president of the Technology Club and the secretaries of the Faculty, the Alumni Association, the Association of Class Secretaries, and the Northwestern Association. (The subject of the observance of commencement by the alumni is discussed elsewhere in this number.)

The matter of class organization among the undergraduate classes at the Institute was reported upon, a Finance Committee was appointed to consider the means of raising revenue for the Association, and it was voted to recommend that notices of changes of address of alumni be sent to the local societies. Adjourned.

FREDERIC H. FAY, '93, *Secretary*,
60 City Hall, Boston.

THE TECHNOLOGY CLUB

The opening of the eighth season of the Technology Club was on October 13, this being the annual meeting, at which the following officers were elected: president, James P. Munroe, '82; vice-president, Francis H. Williams, '73; secretary, Walter Humphreys, '97; treasurer, Seth K. Humphrey, '97; for the council for three years, Arthur T. Bradlee, '88, Howard L. Coburn, '87, Andrew D. Fuller, '95, Walter H. Kilham, '89, Frederick W. Freeman, '01. The report of the secretary showed a membership of 652, the largest in the history of the club. The treasurer's report showed a deficit somewhat the worse from the abnormal prices of provisions and the very low rate of club dues. The Smoke Talk season opened on this same evening with a talk by Mr. Samuel Cabot of the class of 1870, entitled "A Word upon Ciphers to those who dare investigate." Mr. Cabot interested the club members by a discussion of many ciphers, especially of those of Francis Bacon. On the second evening of the season, Wednesday, November 11, Dr. Fred W. Atkinson told the club about his experiences in the Philippines. An informal discussion took place afterward, being started by a Filipino who has recently become a student in Cambridge. The discussion only confirmed the belief of all present in the veracity of Dr. Atkinson's statements. On the third evening, Friday, November 20, Mr. V. A. Tsanoff, of Bulgaria, who is studying at Harvard University, gave a most intelligent talk on the causes and results of the recent Macedonian Revolution. A discussion followed this talk, in which many of the club members took part. A few days later Mr. Henry Plympton Spaulding,'92, held an exhibition of his paintings in water color. The club house was opened to ladies each day between ten and twelve and two and six o'clock. At the fourth Smoke Talk, Tuesday, December 1, Mr. A. Lawrence Rotch, '84, director of the Blue Hill Meteorological Observatory, told of the proposed Aëronautical Competition at St. Louis, and gave an account of the balloon races at Paris in 1900 and of some notable ascensions. This talk was illustrated by lantern slides. Professor Simon Newcomb was expected to speak

on this evening, but was called to Washington on important business.

On the fifth evening, Friday, December 11, Mr. Charles F. F. Campbell, '01, spoke on "Seeing by Touch," or "How the Blind become Self-supporting." Mr. Campbell described in a most graphic and interesting way the modern methods of "helping the blind to help themselves." During the evening, in addition to the stereopticon pictures, the games and races of the blind were shown by means of a cinematograph.

Besides the usual number of formal and informal dinners which have been held at the club, several luncheons have been given. The Institute thus entertained the Mosely Commission on October 27, before their inspection of the Institute buildings.

The usual reception to college graduates was held at the club on October 23. On Saturday, December 12, the Faculty received representatives from the secondary schools about Boston at the club, and after an informal lunch the subject of increased entrance requirements was discussed.

WALTER HUMPHREYS, '97, *Secretary*,
83 Newbury Street, Boston.

NEWS FROM THE CLASSES

1868.

ROBERT H. RICHARDS, *Sec.*, Mass. Inst. of Technology.

The following is from the *Engineering News* for Oct. 29, 1903: —

Charles Ezra Greene, professor of civil engineering and dean of the Department of Engineering of the University of Michigan, died at his home in Ann Arbor, Mich., on October 16. He had been ill for two years past, but his recovery was expected; and the end came suddenly. His death resulted from paralysis of the heart.

Professor Greene was born in Cambridge, Mass., Feb. 12, 1842. After a preparatory course at the Cambridge High School and at Phillips Exeter Academy, he entered Harvard College in 1858, and was graduated from that institution as a Bachelor of Arts in 1862. His first work was in connection with an establishment for manufacturing breech-loading rifles; but in the early part of 1864 he enlisted for service in the Union Army, first doing duty as quartermaster's clerk in the rendezvous camp at Readville, Mass. In January, 1865, he was commissioned a first lieutenant in the Seventh Regiment of United States colored troops, then serving before Richmond, Va. He became regimental quartermaster, and with his regiment he was transferred later to Indianola, Tex., where he resigned his commission in August, 1866.

Upon leaving the army, Mr. Greene determined to adopt the profession of civil engineering, and with this end in view he entered the Massachusetts Institute of Technology, and graduated from that school in 1868. He was immediately appointed assistant engineer on the Bangor & Piscataquis Railroad in Maine, and on completion of that work he was employed by General George Thom on United States River and Harbor Improvements in Maine and New Hampshire. He left this service to become city engineer of Bangor, and in 1872 he was called to the chair of civil engineering in the University of Michigan, having previously declined a similar position in Washington University at St. Louis. Professor Greene had now entered upon his life-work, and at the time of his death he had completed thirty-one years of continuous duty as professor of civil engineering in that institution.

He was the first dean of its Department of Engineering, and had held that office for eight years.

Professor Greene succeeded at the University of Michigan the late Professor De Volson Wood, who had been at the head of this school of civil engineering for fifteen years, and had brought it to a high degree of efficiency. In 1872 Professor Greene was still a young man and without experience in teaching; and this call to succeed a veteran and very popular officer was a severe test of his abilities. But no one could have more successfully sustained the trial. To start with, Professor Greene had the advantages of a liberal education, backed by considerable experience in actual practice of the profession of civil engineering; but, in addition to these essentials, he possessed certain traits of character which are absolutely necessary for the making of an instructor of the highest order. He was naturally endowed with clearness of apprehension, a clean-cut style of expression. A quiet, self-possessed manner gave him control over others; and he was enthusiastic in all that related to his work, and took a hearty personal interest in the progress and welfare of his pupils.

The best indication of his success as an instructor lies in the fact that his department moved on as steadily as if there had been no change in its head, and it at once began to expand. Professor Greene is credited by the officers of the University with having brought about the organization of the co-ordinate branches of mining and mechanical engineering as parts of the university course. The Department of Mining Engineering was established in 1874 under Professor Pettee. The department of Mechanical Engineering, including Marine Engineering, was an outgrowth of the Act of Congress of 1878, authorizing the Secretary of the Navy to detail engineer officers of the United States Navy as instructors in universities and scientific schools. In 1880, Professor Greene strongly advised the then acting president of the university to take advantage of this provision of the law; and the fortunate result was the appointment of Professor Mortimer E. Cooley to the new chair of mechanical engineering at the University of Michigan. It is thus chiefly through the influence and energy of Professor Greene that the university now possesses a Department of Engineering, consisting of three well-established and well-equipped and flourishing branches.

Aside from his labors in the university, Professor Greene did efficient work outside of that institution, both as an engineer and as a contributor to scientific literature. In 1880 he was chief engineer of the Toledo, Ann Arbor & Northern Railroad. In 1882 he was superintendent and then consulting engineer for the erection of the Maumee bridge of the Wheeling & Lake

Railroad, at Toledo, Ohio; and he was also consulting engineer for the Cherry Street Bridge in Toledo. He furnished the engineering plans and superintended the construction of the water-works at Ann Arbor in 1885, and planned the water-works for Pontiac and Ypsilanti in 1886.

In scientific investigation, Professor Greene was especially active; and he early gave much attention to the development of graphical methods of analyzing the stresses in framed structures. Among his many contributions to engineering literature may be mentioned the following: "A Brief Treatise on the Analysis of Bridge Trusses," 1875; "Papers on Roof Trusses," published in *Engineering News* in 1875–76; and "Graphics for Engineers," which appeared in three parts in 1876–79. This latter and more important publication was divided under the three main heads of Roof Trusses, Bridge Trusses and Arches; and the second and third parts were largely devoted to setting forth a method of graphical analysis original with the author, which was well received by the engineering profession. His latest treatise, "Structural Mechanics," was published in 1897.

It is pertinent to mention here that Professor Greene was in 1876–77 the first paid contributor of *Engineering News*, and he wrote the majority of its editorials during those years.

Professor Greene was the president of the Michigan Association of Engineers and Surveyors for three years after its organization in 1880; and on Jan. 4, 1882, he was elected a member of the American Society of Civil Engineers. He received the degrees of A.B. and A.M. from Harvard University, the degree of B.S. from the Massachusetts Institute of Technology, and that of C.E. from the University of Michigan in 1884.

1870.

PROF. CHARLES R. CROSS, *Sec.*, Mass. Inst. of Technology, Boston.

J. A. Osgood, superintendent of the Western Union Oil Company, of Careaga, Cal., writes under date of December 28, as follows: —

. . . I am now situated some two hundred miles north of Los Angeles and eighty miles north of Santa Barbara. Superintendent of a fine oil camp with some twenty wells. I never have been so situated since I left M. I. T. that I have not been obliged to put in practice the teaching of the M. I. T. course, though I was in the Institute only two years. After a six months'

trip of engineering in the field last spring I was offered my present position. I like mining, and don't care so much for oil; but I got switched to this place. That is, I didn't feel like refusing the offer.

I hope to be in Boston late next summer to meet my old comrades of the war, when the Grand Army of the Republic meets there, and shall certainly try to call on you then. . . .

Mr. Osgood's address is San Luis Obispo, Cal., care of Mr. Snyder, Railway Postal Clerk.

1874.

CHARLES F. READ, *Sec.*, Old State House, Boston, Mass.

The Class Association will celebrate the thirtieth anniversary of the graduation of the class in 1874 by a reunion at which the wives and children of the members will be present. The reunion, which will be similar to the one held in 1899 to celebrate the twenty-fifth anniversary of graduation, will take place at the Technology Club on Tuesday evening, Jan. 12, 1904. President Pritchett and several professors who were at the Institute with the class from 1870 to 1874 have accepted invitations to be present. — Much to the regret of his former classmates, Colonel Samuel P. Colt, of Bristol, R.I., who was nominated by the Republican party of Rhode Island for the office of governor, was defeated at the late elections in November. — Edward H. Barnard, the well-known artist, has been having recently an exhibition of his pictures in this city. — The late Amos J. Boyden, who graduated from the Institute in 1875 and whose obituary is printed under 1875, entered the Institute in October, 1870, with the class of 1874, and was at the time of his death a member of the Class Association. — Captain Albert C. Warren, aide on the staff of Brigadier-general J. H. Whitney, commanding the Second Brigade, has been appointed assistant inspector-general on the staff, taking the place of Major Henry P. Ballard, retired. This promotion gives Captain Warren the title of major. He has been identified with the militia for the last thirty-two years.

1875.

E. A. W. HAMMATT, *Sec.*, 10 Neponset Block, Hyde Park, Mass.

Amos Josiah Boyden, son of Stephen L. and Emeline (Hodges) Boyden, was born Sept. 8, 1853, in Foxboro, Mass. He graduated from the Institute with the class of '75 in Course IV., and for about two years was with Stone & Carpenter, architects, Providence, R.I. Then he opened an office in Boston, where he remained two years, when he went to Philadelphia as the representative of Cabot & Chandler, architects. Since 1883 he has been in business as an architect in Philadelphia, until his work as designer and superintendent of construction of government buildings took him to Indianapolis, Ind., where he died on Nov. 28, 1903. He always took a great deal of interest in his native town, and made an address at the Foxboro centennial celebration. He was interested in genealogy, and assisted in the preparation of the "Boyden Genealogy." He was a Fellow of the American Institute of Architects. Boyden married Annie L. Sherman, of Foxboro, May 5, 1882, who with two sons survives him. His body was buried in Foxboro.

1878.

LINWOOD O. TOWNE, *Sec.*, Haverhill, Mass.

A year ago, at the twenty-fourth reunion at Young's, President C. M. Baker informally suggested that he would be the host when the class should gather this winter for the twenty-fifth time after graduation. The fulfilment came on the evening of December 19 in response to more definite invitations to dine then at his home, Ivy Street, Longwood. With few exceptions all the men now in New England had responded favorably; regrets from the Westerners were unfortunately more numerous. For a class sixty-four all told and graduating but nineteen, the eighteen present made the high tide of any reunion. Dinner was served in the music-room, where in the centre of the table was the class gift to the president,

a silver champagne cooler filled with Jack roses,— a similar future use Mr. Baker, in his few words of acceptance, prophesied as more likely than the one intended by the designers. The first act at the table was drinking to the class from small silver cups, engraved M. I. T. 1878–1903, personally filled by Mr. Baker and part of his thoughtfulness as souvenirs of the occasion, together with loving-cups that came later in one of the courses of the elaborate menu. Cards with literary selections appropriate to each showed that the years had brought knowledge of his guests to the host. Their reading and the cheerful bantering that followed helped all to feel that they were but boys again, as when first climbing the steps of Rogers, the lone building of those earlier days. That Emile Williams has finally succumbed and will shortly become a Benedick was news indeed and the approaching event was appropriately toasted. Mr. Eben S. Draper as "Our Political Member" was obliged to acknowledge his fealty to Republican principles, as also to bearing the class honor as a member of the Corporation of the Institute. Mr. E. P. Collier acknowledged having rocked the cradle most numerously, for five arrivals. Mr. C. S. Rackemann spoke warmly of his love for Technology and the class, even though leaving it for the law. At the twenty-fifth anniversary of graduation, last June, it was a matter of congratulation that the circle of those both entering and graduating together had suffered no break. The one note of sadness to this first reunion after that anniversary was mention of the death in November, at Denver, of Julian A. Kebler, the youngest of the class and the first to go. Mr. Rollins, one of Mr. Kebler's closest friends, spoke feelingly of his life. Those at the dinner, besides President Baker, were Bradford, Collier, Draper, Eaton, Higgins, Miller, Nichols, Rackemann, Rich, Robertson, Rollins, Sargent, Swain, Schwamb, Williams, Woolworth, and Towne.—* On November 19, L. O. Towne, who is master of the Science Department in the high school at Haverhill, Mass., spoke before the Appalachian Mountain Club in Boston. His subject was "The Work of the Summer School of the Teachers' School of Science in Nova Scotia." Towne, having previously been

* The following is furnished by Professor George H. Barton.

a member of the school in Boston, was a member of the Summer School in Nova Scotia in 1902. Here he paid special attention to taking photographs illustrating all parts of the work done by the school. These photographs he has personally reproduced in finely colored lantern slides, about eighty of which he used in illustrating his lecture. The plan of the Summer School is to visit and study the principal regions of interest in mining, minerals, geology, natural scenery, and of historic associations. Landing at St. John, N.B., the line of the Intercolonial Railway is followed via Truro and the Bras d'Or lakes to Sydney, C.B., then back to Truro and to Halifax. Thence the route is by the Dominion & Atlantic Railway via Windsor and Annapolis to Digby, and by steamer back to St. John. The important features described were the following: The "bore" at Moncton, N.B., which passes up the Petitcodiac River with the speed of a race-horse and a crest varying from five to twelve feet in height. The coal mines at the South Joggins, N.S., with the method of working; and the grand coast section at the same place in the carboniferous strata. In the neighborhood of Parrsboro the high and low tides in the river and in the Basin of Minas were shown in companion views alternately from the same point. The picturesque scenery of Partridge Island, Wason's Bluff, and Cape Blomidon, and the collecting of minerals from all three of these places. The National Park at Truro, not very large, but exceedingly picturesque. The great steel works at Sydney and the old fortifications at Louisburg. At Halifax there are exceptionally fine examples of glacial scorings on an extensive scale, and a large rocking-stone, estimated to weigh 464 tons, upon which the party were all rocked at once. Here also visits were made to the citadel and other places of interest in the city, to the Waverly gold mines not far away; and a sail was taken around the various branches of the landlocked harbor. At Windsor the gypsum quarries were visited, and numerous brachiopods were collected in the limestone. At Wolfville, drives were made to the Look-off, to the Gaspereau valley, and to Grand Pré, the home of Evangeline, or, more correctly, of the early Acadians. At Annapolis the school was entertained by the board of trade at an

afternoon tea, the mayor making a speech of welcome, and the band adding to the welcome by first playing "Yankee Doodle," and later on many American airs. The old Fort Royal here was thoroughly inspected, and a walking trip made over North Mountain. Leaving Digby, the little steamer passed through the famous Digby Gut, a veritable though small Golden Gate; and a farewell to Nova Scotia and to the audience was given in a beautiful moonlight view of Digby Gut in the distance as seen from the stern of the steamer. The lecture was given in Room 22, Walker Building, M. I. T., which was filled with an appreciative and enthusiastic audience. Towne deserves very much credit for his careful selection of valuable scientific and historical subjects, for his painstaking reproduction in slides, and for his willingness to allow the public to have the benefit of his work. [G. H. B.]

The following is from the Boston *Transcript* for Nov. 20, 1903: —

Julian A. Kebler, former president of the Colorado Fuel and Iron Company, died suddenly in Denver, Col., of apoplexy. He was born in Cincinnati forty-six years ago. He graduated at the Massachusetts School of Technology of Boston. Twenty-five years ago he went to Western Missouri, where he engaged in the coal mining business; and in 1885 he went to Colorado with John Osgood, and organized the Colorado Coal Company, which was later merged into the Colorado Fuel and Iron Company. Mr. Kebler was general manager for the latter company from its organization until two years ago, when he was elected president. A year ago his health failed him, and a little later he tendered his resignation. At the meeting of the company last August he was succeeded by F. J. Hearne. Mr. Kebler was married fifteen years ago to Miss Emma Abbott, of Boston, who survives him. They had no children.

1879.

HARRY H. CAMPBELL, *Sec.*, Steelton, Penn.

Frank G. Stantial, superintendent of the Cochrane Chemical Company, on account of extensive alterations and repair at their factory at Everett, was unable to take any vacation this summer. Being an enthusiastic golfer, he did, however, find some time to

spend on the links of the Bellevue Club at Melrose. Mr. Stantial's daughter Helen will celebrate her first birthday in February. — Walter S. Allen was the Democratic candidate for the Massachusetts Senate in the New Bedford district this fall. This district being strongly Republican, however, he failed of an election.— Professor Pickering and E. C. Miller were the only members of this class attending the alumni dinner at the Hotel Brunswick. The fact that the class were to hold their class dinner at the Calumet Club in New York on December 28 may account for the small attendance. It would seem as if changing the alumni meeting and dinner to the spring might prevent the interference with the annual class dinners in the winter.— Edwin C. Miller has purchased a 125-acre farm in Peterboro, N.H., for a summer residence. It is located three miles from the village, at an elevation of nearly 1,000 feet, and commands a very extensive view, facing Mt. Monadnock. There are eighty acres of woodland, and we understand that he is contemplating the raising of Angora goats, ginseng and other up-to-date agricultural fads.— Charles W. Coffin, after a brief illness with pneumonia, died on Nov. 11, 1902, at Biddeford, Me. The deceased was a civil engineer by profession, a graduate of Harvard College, and a special student in 1878 at the Institute of Technology. He had been successful in his profession, and had retired from active business.

1882.

WALTER B. SNOW, *Sec.*, Russell Avenue, Watertown, Mass.

James E. Chapman, of Evanston, Wyo., was in Boston during the holidays.— The *Journal of the American Foundrymen's Association* for July, 1903, contains in full the address of its president, Arthur W. Walker. In discussion of the labor situation he expressed himself as believing "that the manufacturers who will achieve the highest development and success during the next ten or twenty years will be those who recognize the present conditions as temporary, and set themselves in line for permanent, harmonious, and cordial relations with the men who are doing for them in

factory or foundry the work which they themselves would if the size of their enterprise would permit." — James P. Munroe was elected in December president of the Massachusetts Reform Club. His "Adventures of an Army Nurse in Two Wars," recently published by Little, Brown & Co., is edited from the diary and correspondence of his aunt, Mary Phinney, Baroness von Olnhausen.

1883.

HARVEY S. CHASE, *Sec.*, 27 State Street, Boston, Mass.

H. S. Chase has been retained by Jones, Cæsar & Co. to supervise the new accounting system for Minneapolis, and is appointed on the Committee of Experts (chairman) to act with the United States Census officials in regard to uniform statistical tables for municipal reports throughout the country. He was in Denver most of the month of December.

1885.

PROF. E. B. HOMER, *Sec.*, Rhode Island School of Design, Providence, R.I.

Little Arthur and Mac found themselves at adjacent tables on December 21 at a New York club. The following notes passed between them: "The Alumni Meeting is taking place in Boston. Here's to M. I. T." "To the last class that gave a Freshman ball. I was stuck twenty, and so were you!" "The last of the Torch-light Processions, you and Nat both trying to pay for the herdic while I stumbled down the Gym unlighted steps."— Little & Walker announced on Dec. 1, 1903, their removal to 93 Broad Street, corner of Franklin, Boston.

1887.

EDWARD G. THOMAS, *Sec.*, 4 State Street, Boston.

Cole was in attendance at the annual dinner of the Alumni Association, and is spending the holiday season at his home in Newton.— Sprague is just now on his way to Cuba to report on a copper mining proposition.— H. S. Adams has moved his offices to 71 Ames Building, Boston, Mass., where he will have greater facilities for carrying on his work. Among other work that he has on hand at the present time is the superintendence of a large dredging contract in the Mystic River, and the construction of wharves and bulkheads in South Bay.— Burgess, during the past year, published two books, one entitled "More Goops," a book for children, and "The Reign of Queen Isyl," the latter volume being written in collaboration with Will Irwin, with whom he is now writing the story running in *Pearson's* entitled "The Picaroons," and which will be published in book form in the spring. Next fall he will publish "The Maxims of Methuselah," in which that patriarch in his nine hundred and sixty-ninth year gives to his great-grandson Shem, on his twentieth birthday, his accumulated wisdom resulting from his long experience with the women of the Land of Nod. While in Southern France, Burgess became a landed proprietor, and the following is cut from the Christmas *Frank Leslie:* —

The race of "Goops" have made their creator, Gelett Burgess, famous, and each new edition of the circular small people, like the "More Goops" recently published, spreads their fame more widely. Mr. Burgess has recently bought a small property in Provence, near the Val d'Enfer, where Dante is supposed to have gained the inspiration for his "Inferno." The property, which cost Mr. Burgess only $40, is supposed to contain more than twenty Roman tombs of the third century. One of these has already been opened, and the others are to be explored this winter.

Giles Taintor has been admitted to practice in the courts of the United States. . . . Miner Robinson is building a factory at Faneuil, Mass., for the manufacture of "Renim" switch and outlet boxes and other specialties which he is putting out. The building is about 50 x 100, one story, and when completed will contain not only the manufacturing establishment, but his offices as well.

1888.

WILLIAM G. SNOW, *Sec.*, 245 No. Broad Street, Philadelphia, Pa.

Arthur S. Mann has charge of the building of the new turbine engine power plant of the General Electric Company at Schenectady, N.Y. His health was completely restored by his Australian trip. — Dr. Edwin O. Jordan, of the University of Chicago, is one of the editors of the *Journal of Infectious Diseases*. — Stone & Webster are occuping their new spacious offices on the ninth, tenth, and eleventh floors of the India Building, 84 State Street, Boston. — Irving T. Guild has entered into partnership with Harlan P. Kelsey for the practice of landscape architecture, with offices at 6 Beacon Street, Boston. Mr. Guild has been studying this profession for several years. Mr. Kelsey is already well known as the owner of the Highland Nursery in the Carolina Mountains. — Charles A. Stone is occupying a house on the Back Bay for the winter. — James L. Belser has severed his connection with Lockwood, Green & Co., Boston. — A. S. Warren has resigned his position with the Buffalo Smelting Works. His present address is 426 Marlboro Street, Boston. — The secretary was very glad to receive a letter in December from Arthur W. Jones, who has been located for a number of years in Australia as representative of the General Electric Company. The substance of the letter follows: —

"I read with much interest the circulars to the members of the class of 1888, outlining the celebration of the fifteenth anniversary of our graduation from the Tech, and thought of you on Saturday, June 20, as enjoying the programme outlined.

Fate has unfortunately decreed, since my graduation, that most of my time must be spent about as far away from Boston as it is possible to get on this globe; but I assure you that I have, and always have had, a real live interest in the Tech, and particularly in the class of '88. The more one lives away from home, the greater appear the advantages of American life and surroundings. Of all places in the southern hemisphere, I know of none which I should rather make my home than Melbourne or Sydney; but neither compares with Boston, and there is a constant yearning to get home again. Before very long I hope to make a trip to the States, and trust that it may be at a time when there is a class reunion of some sort.

Business out here is fairly good, but not what it ought to be, considering the population. English conservatism, in a somewhat aggravated form, exists throughout this territory, and proves a very serious check to progress, particularly in matters electrical. Then, too, there also exists here a natural desire to deal with the mother country (England), when possible; and this feeling has to be broken down before trade with the United States can be established. We have, however, been pretty successful in electrical tramway matters, having already equipped the complete tramway systems of Sydney (N. S. Wales), Brisbane (Queensland), Kalgoorlie and Perth (Western Australia), and Auckland and Wellington (New Zealand). It is good to see American machinery in many of the lighting stations here, and our arc lamps lighting me home after a hard day at the office are a pleasing reminder of the land from which they came.

From the point of view of the primary industries of these colonies the present season is likely to be a record-breaker. For the seven years that I have been in Australia we have had nothing but a continued series of devastating droughts. Sheep have died by the million, and cattle by the hundreds of thousands; and the cry of the people has gone up from the thirsty land. Only six months ago, in making a long trip into the country, I passed through hundreds of miles of fertile country laid waste by the scorching sun of Australia. Instead of grass, nothing but dust, and dust so thick and deep that in places it absolutely covered the fences. Occasionally a group of starving sheep and cattle, and all round a temperature of 110° to 120° in the shade. It has only taken a few months to change all this, and the other day on a trip through the same country one could see nothing but fields of grass and grain as far as the eye could reach. The recuperative power of the people and the soil is wonderful; and, whereas for a number of years the crop of wheat has not been sufficient for local needs, they are now talking about a probable crop of 30,000,000 bushels this year, much of which will be available for export. This prosperity is reacting on every line of business. . . . Give my very best remembrances to any members of the class of '88 whom you may meet."

1889.

WALTER H. KILHAM, *Sec.*, 9 Park Street, Boston, Mass.

The secretary finds that occasional clippings from newspapers and hearsay evidence is a very poor method of collecting news for this column. Items acquired in this manner have no great value

as information, and do not satisfy the rapacious editors of this publication. If the members of '89 care at all for this column of class news and are willing to help enlarge its scope, it will be necessary for them to voluntarily send to the secretary items relating to themselves, as well as anything they may hear of concerning their classmates. The secretary hopes that none will be too modest to respond to this request.— Clayton W. Pike is a member of the firm of Keller, Pike & Co., mechanical and electrical engineers and contractors, No. 112 North Broad Street, Philadelphia. They have just completed the electrical plant for the new United States Mint at Philadelphia. This building is lighted by over 4,000 incandescent lamps, and has about 150 motors, aggregating over 800 H. P. It has a complete fire alarm system, watchman's clock system, time clock system, and telephone exchange, all of these operated by a storage battery plant in duplicate. The size of this plant and its great variety make it one of the most important which they have ever installed.— Mr. and Mrs. G. M. Basford sailed on the steamer "Minneapolis" from New York for Europe on November 25.— The Boston *Traveller*, Sept. 26, 1903, has the following: —

> The members of the Prospect Street Congregational Church, Cambridge, voted unanimously last evening in favor of calling Rev. Charles E. Beals, pastor of the Second Congregational Church of Greenfield, to become the pastor of their church. This was in concurrence with the decision of the Outlook Committee, which was composed of several well-known members, whose work it was to find a candidate. This committee's vote was also unanimous in favor of Mr. Beals.

1890.

GEORGE L. GILMORE, *Sec.*, Lexington, Mass.

Calvin W. Rice is vice-president of the American Institute of Electrical Engineers, and is serving on various committees. He is now connected with the General Electric Company as a consulting engineer, with office at 44 Broad Street, New York.—An informal gathering of the members of the class located near Boston

was held on January 13 at the studio of H. P. Spaulding, 19 Fairfax Street, West Newton, where with the aid of crackers, cheese, and beer old days were recalled.— Karl H. Hyde is engaged in business as an engineer and architect at Attleboro, Mass.— Mr. Walter Ellis's address is now care of Boston Athletic Club, Exeter Street, Boston.— E. B. Raymond is general superintendent of the General Electric Company at Schenectady, N.Y., and in the absence of Mr. Emmons is acting general manager. Raymond has just built a new house there, and is well settled in his new home.— E. T. Newton is treasurer of the Chemical Paper Company of Holyoke, Mass.— Darragh de Lancy is settled in Great Barrington, Mass., as an industrial engineer.— W. H. Collins has been transferred from the Silver Spring Bleach and Dye Works branch of the United States Finishing Company at Providence, R.I., to the Norwich plant at Norwich, Conn.

1891.

HOWARD C. FORBES, *Sec.*, 4 State Street, Boston.

Cunningham is in Santa Barbara, steadily improving in health. Last winter he took a trip to Japan, and about next June he expects to go abroad, and will spend the summer in Germany.— Fiske has recently been made home manager of the Special Risk Department of one of the largest insurance companies in Hartford, Conn. This is probably the first case of a technical graduate being made manager in the home office of a stock fire insurance company. Fiske writes: —

In reference to my recent change. I resigned Dec. 1, 1903, as manager of the Underwriters' Bureau of New England to accept a position with the Phœnix Insurance Company (Fire) of Hartford, Conn. My new title is Manager, Special Risk Department, this being a new department formed to have charge of such classes of risks as those equipped with automatic sprinklers, electrical properties (power plants, car barns, etc.), fireproof buildings, etc. My field will embrace this country and Canada; and the classes mentioned are to be divorced from the general business of the company and handled entirely by the new department. In this work my chief

duties consist in passing and approving the lines of insurance on these properties as sent in by our agents, both as regards amount of insurance to be carried and policy form under which it is written, it being purely a matter of business to write insurance on such risks as we believe will yield a profit and keep off those which we believe at the rate offered will in the long run show a loss. The insurance companies are beginning to realize that modern construction and protected risks need modern treatment, and the engineering questions involved need an engineering training to properly solve them. I believe there is a good field for technical men in this line of work, and the business surely needs the services of men who have the knowledge and training to properly solve the various problems of a technical nature which are continually arising. I have procured a home at 146 Kenyon Street, Hartford, and will be very glad indeed to see any of my classmates either there or at the Phœnix office.

— Garrison gave a lecture at the Tech Union on November 28, on the De Laval Steam Turbine, before about sixty members of the Electrical Engineering Society. Several of the turbine parts were exhibited. A similar lecture was given December 19 before the Engineers' Blueroom Club, and also on December 31 at the Society of Arts, Massachusetts Institute of Technology.— Swan, who is with the New York Ship Building Company at Camden, N.J., writes the following: —

I don't know of any items which I can give you that would be particularly interesting: one gets so used to his own professional work that it seems very commonplace. We have a very large plant here, and are turning out a great deal of work, some of the ships being about the largest ever constructed in this country. At present, however, there is little commercial work in sight; and it looks as though American ship-yards that cannot get enough naval work to occupy them will soon have to close down.

I am going to make a great effort to be on hand at the class dinner next spring. For the past few years something has always turned up to prevent my going.

With kindest regards to yourself and to any of the fellows whom you may see.

— Ricker is now located in New York, with the N. Y. C. & H. R. Railroad, as electrical engineer on the equipment of the famous tunnel with electric motive power. Ricker writes: —

During the winter of 1902, and till August, 1903, I was in charge, as electrical engineer, of the installation and operations of the Miami & Erie Canal Transportation Company's plant, consisting of an alternating current electric railway, over which run locomotives towing canal boats in long strings. As this is the first plant of the kind and the first alternating current railway in America, it may be interesting to the rest to know that one of our numbers was in part responsible for it. I was also engaged on the preliminary work for the Washington, Baltimore & Annapolis Railway; but, as work there is delayed by financial conditions that are affecting many other matters as well, I came to New York with the N. Y. C. & H. R. Railroad, where I have charge of one of the departments of detail engineering in connection with the electrification of the New York terminal and suburban service.

This is a very large and interesting work; and I am hoping they will give me a chance to settle down in one place for a little while, long enough to see what it is like, at least. I have joined the Technology Club of this city, and am expecting to find it very agreeable. It seems good to meet a bunch of men from the Institute again.

Please give my regards to any of the men of our class you may meet. I hope I may be able to attend some of the class meetings or dinners now that I am within a few hours' ride of Boston.

— Wilder, who is treasurer of the Merrimac Chemical Company, reports that they are putting out arsenate of lead all over the country, and that it is rapidly taking the place of Paris green, as it is more efficacious as an insecticide. It has been largely used in exterminating the gypsy moth, and is the material that no doubt many have noticed on the streets, which is being sprayed on the trees. The cities of Boston, Hartford, Albany, and others are using it to exterminate the elm-tree beetle. Large carloads of arsenate of lead have been shipped in the past few years to the South to aid in fighting the boll weevil pest which is making such serious havoc in the cotton crop.— The new stadium for Harvard College at Soldiers' Field was built under the superintendence of Wason, who is president and manager of the Aberthaw Construction Company. The following letter from Wason will undoubtedly be of interest: —

We broke ground on the 22d of June, and had the structure practically finished on the 14th of November, when the Harvard-Dartmouth game was played within the stadium.

The structure consists of Portland cement concrete re-enforced with square twisted steel of the Ransome system. The general dimensions of the building are 1,430 feet in circumference of the U, 95 feet wide, and 53 feet high. The seating capacity is about twenty-six thousand. To the best of our knowledge, this is the largest concrete-steel building structure in the world.

The coming season it is the intention to add a roof above the promenade floor, which will make the total structure 71 feet high.

The structure consists of a low front wall enclosing the gridiron, with three rows of columns rising higher and higher, and an outer wall consisting of a double row of arches. Between the third row of columns and the outer wall there is a mezzanine floor, twenty-five feet from the ground, and a promenade floor, fifty feet, each sixteen and one-half feet wide, and running the full length of the structure.

All longitudinal girders are of steel-concrete. Across the tops of these, following the incline, are steel beams with a bearing riveted to the top flange which supports steel-concrete seats which were cast in moulds on the ground and afterwards erected.

Approximately 15,000 barrels of cement were used in the construction, and as many tons of broken stone.

The finish of the wall surfaces was obtained by picking with steel points, removing one-sixteenth of the surface entirely, thus obliterating all imperfections caused by the wood of the moulds.

To Professor Ira N. Hollis is due the entire credit of the enterprise. He conceived the idea, perfected the design, raised the money, and signed the contract.

— The class of '91 furnishes the principal part of the force of the New England Structural Company. Douglas is vice-president and general manager, Bryden is superintendent, and Fitz is secretary. They have built the structural frames for about 80 per cent. of the modern office buildings in Boston, including the Colonial Theatre, Boston Symphony Hall, Eastern Building, Devonshire Building, and others. Last summer they constructed a highway bridge across the Connecticut River at Northfield. At their shops at East Everett they have recently installed two De Laval steam turbines, which are used for driving electric generators for lighting and power about the works. These were furnished by Garrison. The

last of these machines to be installed was tested by Forbes in collaboration with Thomas, '87.— At the recent meeting of the Association of Class Secretaries, it was thought advisable to suggest that all the class dinners should be held at Commencement. It is the intention, therefore, of the President and Secretary of our class to call together the fellows in the immediate vicinity, and take the necessary steps for holding the class dinner this year some time about the first of June. The Secretary will be glad to obtain the views of any member of the class in regard to this proposed change.

1892.

Prof. William A. Johnston, *Sec.*, Mass. Inst. of Technology, Boston, Mass.

The class secretary was pleased to notice the excellent articles in the last Review by members of the class; namely, "Review of the Report of the Charles River Dam Commission," by Leonard Metcalf; "The New Buildings," by Theodore Skinner; and "Lowell Institute School for Industrial Foremen," by the director, Charles F. Park. This generous contribution from the members of the class more than compensated for the lack of class news on account of the secretary's illness with typhoid fever.— The class is well represented in the new School for Industrial Foremen. Charles F. Park, as director, has had the responsibility of planning the courses, which are of two years' duration in mechanical and electrical engineering respectively. The school is now organized, and has started in successfully under his efficient directorship. During the first year the following courses will be given by '92 men: Electricity and Magnetism, by Louis Derr; Practical Mathematics, by W. A. Johnston. During the second year Mechanics and Testing Laboratory will be given by Charles E. Fuller.— Mrs. Edward C. Holton (formerly Miss Lovering, '92) visited the Institute with her husband, E. C. Holton, '88, on November 10.— The following note was received from Macy S. Pope in response to an inquiry about the men connected with the Factory Mutual Fire Insurance Company: —

As I stated when I met you the other day, two '92 men have recently been added to the corps of the inspectors of the Factory Mutual Fire Insurance Company ; namely, Harry A. Burnham, II., who for six years was mechanical superintendent at the Passaic Print Works and later with Dean & Main, mechanical engineers ; also Frederic J. Hoxie, VI., who has been electrical contractor at Phenix, R.I. This makes four '92 men with the Factory Mutual, John G. Morse, who was in the civil engineering course for about two years, making the third, and myself the fourth. I might note that there are seventeen Tech men in our office. Gorham H. Dana has recently been appointed manager of the Underwriters' Bureau of New England. Frederick C. Moore, X., who is inspector for the Factory Insurance Association, Hartford, called at our office recently. Ward M. Sackett, VI., is reported as in the insurance business in Pittsburg, so that, with Gayle T. Forbush, there are eight '92 men in the insurance work. This indicates to some extent the demand for men with a technical training in this branch of business.

— The following is a clipping from the *Standard*, an insurance paper, and explains itself: —

Gorham Dana was elected manager of the Underwriters' Bureau of New England, succeeding H. A. Fiske, resigned, at the annual meeting of that organization held Wednesday morning at 93 Water Street. There was an unusually large attendance of company representatives, and the action in the above matter was unanimous.

Mr. Dana has been connected with the bureau since 1894, and his close application to his duties and intelligent study of the various problems which have necessarily arisen during that time, affecting insurance interests in this jurisdiction, have given him an experience and insight into New England conditions which are of great value. His election to this position was most logical, and will elicit only commendation in all quarters.

Gorham Dana was born at Charlestown, Mass., in 1868, receiving his early education in the public schools of his native city. He then entered the Massachusetts Institute of Technology, being graduated in 1892 with honors in the course of civil engineering.

Soon after graduation he left Boston for California, where he was employed for about a year with the United States Geological Survey, and also attending the University of California as advanced student, and later as assistant instructor. Returning to Massachusetts, he was assistant in civil engineering at the Institute of Technology in 1893 and 1894. He resigned

this position to enter the service of the bureau as an inspector, where he has remained ever since. Mr. Dana has been closely allied with ex-Manager Fiske in the work of the bureau, having thus attained a practical knowledge of Mr. Fiske's methods and system. Mr. Dana is a man of careful discrimination and conservative judgment, and contemplates no radical changes in the conduct of the organization.

He has devoted much of his time to literary work along the line of scientific subjects, which has been closely studied by underwriters and inspectors because of his accurate and valuable exposition of sound principles in fire protection and special hazard writing.

Among his technical writings are "Fire Insurance Engineering," which appeared in the TECHNOLOGY REVIEW, April, 1903; "The Care of Private Fire Appliances from an American Insurance Standpoint," a paper read at the International Fire Prevention Congress at London in 1903.

Mr. Dana has also prepared bureau reports on the following subjects: "Viscol"; "Coating of Cloth with Rubber Cement"; "Corrosion of Outside Screw and Yoke Valve Stems"; "Corrosion Tests on Painted Pipes"; "Celluloid: Its Manufacture, Properties, Uses, and Hazards"; "Electric Car Barns: Construction, Protection, and Hazards"; "Hazards of Stock-conveying by Blower Systems"; "Silk Wiping Cloths"; "Metal Lathing and Cement as a Protection for Wooden Buildings against Exposure"; "Report on Ellington Patent Automatic Injector and Other Fire Appliances found in England"; "Chemical Extinguishers"; "Notes on Rubber Hazards"; "Notes on Automatic Pump Regulators."

He has been a member of the National Fire Protection Association since 1901 and a member of the committee on electric fire pumps since 1902.

1893.

FREDERICK H. FAY, *Sec.*, 60 City Hall, Boston.

Informal class dinners will be held at the Technology Club on Saturday evenings, the 23d of January and the 19th of March. At the first Professor Harry E. Clifford will be the guest of the class. The annual dinner will be held at commencement, in June, when the class will hold a celebration in connection with the general alumni reunion proposed for that time. Due notice of all meetings will be sent to the members.— James A. Emery and

Miss Annie E. Comer were married on the 30th of November. They reside at Midway, Ala. Emery is manager of construction of the Birmingham Railway Light and Power Company, his business address being 2104 First Avenue, Birmingham, Ala.— William Reed-Hill became a member last July of the firm of John Scott & Co., architects, 67 Moffat Block, Detroit, Mich. He was formerly head draughtsman for this firm until 1902, when he established the firm of Mason & Reed-Hill, architects, of Detroit.— William G. Houck, of Buffalo, N.Y., has recently recovered from a mild attack of diphtheria. At no time was his illness very serious. — The following account of the work of D. D. Jackson in the preparation of a normal chlorine map of New England and New York is taken from the *Engineering Record* of Oct. 17, 1903: —

Mr. D. D. Jackson, of Mt. Prospect Laboratory, Brooklyn, in co-operation with the Hydro-economic Section of the United States Geological Survey, has finished a normal chlorine map of New England and New York State which will be published in the annual progress report of that section. Normal chlorine maps of States situated near the coast lines have proved extremely valuable from an engineering and sanitary standpoint in connection with the interpretation of analyses of public water supplies and the installation of water-works. It was in 1890 that the Massachusetts State Board of Health in a memorable report presented the first normal chlorine map. This was made after three years of analytical work in connection with the water supply of Massachusetts, and its practical use in connection with problems of domestic water supply was at once appreciated by the chemical and engineering professions. Since that time the State Board of Health of Connecticut has extended the work of the Massachusetts Board through that State, but beyond this little has been reported. The new chlorine map which has been made by Mr. Jackson corrects errors in the original maps of Massachusetts and Connecticut, and covers all New England and New York. From time to time the work will be extended, and it is expected that the entire area of the Atlantic Coast States will be covered within a reasonable period.

— Ervin Kenison, instructor in mechanical drawing and descriptive geometry at the Institute, succeeds Professor Linus Faunce as lecturer in descriptive geometry.— W. T. Knowlton was in Boston in

October, while recuperating from a two months' illness with typhoid fever. He is with Albert L. Webster, civil and sanitary engineer, 82 Wall Street, New York; and from April, 1902, until last summer he was resident engineer upon the construction of a sewerage system at the Hampton Normal Institute, Hampton, Va. At present Knowlton is engaged in similar work near Perth Amboy, and lives at 434 William Street, East Orange, New Jersey. C. V. Allen and P. H. Thomas live in East Orange also.— At a meeting of the Boston society of Civil Engineers, in December, Professor Charles L. Norton gave the results of his experiments upon the rusting of steel imbedded in concrete. His experiments, made under a great variety of conditions, confirm the general belief that steel properly imbedded in concrete is most effectually protected from rust.— Walter T. Peck is in South America as the electrical engineer for W. R. Grace & Co. of Valparaiso, Chile, the representatives of the General Electric Company for Chile, Bolivia, and Peru. Although his headquarters are at Valparaiso, Peck spends a good portion of his time travelling through these three countries.— F. F. Skinner is with Westinghouse, Church, Kerr & Co., 8 and 10 Bridge Street, New York. At present he is at work upon the design of steel-work for the new underground terminal station in New York for the Pennsylvania Railroad. Previously he was with the New York Central Railroad, where he was engaged in the steel design of that road's New York terminal.— Robert N. Wallis is president of the Fitchburg Merchants' Association, and in November presided at its annual banquet, at which the speakers were Senator George F. Hoar, ex-Governor John D. Long, and former Postmaster-General Charles Emory Smith.— The following '93 men were present at the Alumni Dinner, December 21, 1903: Barnes, Bemis, Braman, W. A. Clapp, Crosby, Fay, Frisbie, Keyes, Reynolds, Wingate, Woodbridge.

1894.

S. C. PRESCOTT, *Sec.*, Mass. Inst. of Technology, Boston, Mass.

The secretary wishes to announce that the executive committee of the class has already begun to make plans for the decennial celebration which is to take place in June. Much interest has been expressed by members of the class, and it is confidently expected that we may have a well-attended reunion. We urge that every man make a special effort to attend. A circular relating to this subject and the class book which is to be published will be sent to all members of the class in so far as the secretary has their addresses, and he desires to obtain especially the addresses of non-graduate members of the class. Any information concerning these men will be gratefully received.— The class will be glad to learn that H. R. Bates, who has been seriously ill with nervous prostration, is regaining his health and strength. His trouble seems to have been brought on by overwork, as he has continued to be the same indefatigable hustler that we knew in undergraduate days.— W. E. Piper is again receiving congratulations, this time on the advent of a ten-pound boy.— H. S. Duckworth and H. P. Hastings are other members of the class who have more or less recently had additions to their families. It is evident that Course V. men do not believe in race suicide.— Mrs. A. A. Claflin is ill with typhoid fever. The sympathy of the class and best wishes for her recovery will certainly be extended to the family.— T. C. Davies sends his occupation and address as "sugar factor," Craigside, Honolulu, H.I. Secretary has tried in vain to get an account of life and conditions in Hawaii from Davies, as it would certainly be of great interest to all.— H. B. Dates is professor of electrical engineering in the School of Applied Science, University of Colorado, Boulder, Col.— S. A. Breed is engaged in electrical work with the General Electric Company at Lynn.— L. W. Pulsifer is practising architecture in Denver. His address is 1119 Vine Street.— W. H. Sayward has removed to Wayland, Mass., where he has opened an office for the practice of medicine.— A. B. Tenney is treasurer of

the Malden Electric Company and Suburban Gas and Electric Company, with offices at 159 Devonshire Street, Boston.— J. E. Thropp, Jr., has associated himself with the Carnegie Steel Company, Blast Furnace Department. His address is P.O. Box 33, Duquesne, Pa.— C. H. Cutler is inspector for lines of the New York and New Jersey Telephone Company, 160 Market Street, Newark, N.J.— A. W. Tidd is assistant engineer for the Commission on Additional Water Supply for New York City.— F. A. Schiertz has been spending some time in Boston after an absence of seven years in mining work in Mexico.— Robert Loring was married not long ago to Miss Mackay, of Montreal, a sister of A. R. Mackay.— H. A. Swanton is draughtsman for the Lawley Company, South Boston, and resides in Roxbury.— C. F. Hopewell is general manager of the Uni Signal Company, Cambridge.— N. H. Janvrin is assistant engineer for the American Bridge Company, Pittsburg.— R. W. Proctor is secretary of the W. S. Merrell Chemical Company, Cincinnati.— R. H. Kirk is chief engineer of the "Long Arm" System Company, Cleveland.— C. H. Johnson is civil engineer with the N. A. Murtfeldt Company, concrete construction, 31 Milk Street, Boston. This company makes a specialty of buildings constructed entirely of concrete masonry.

1896.

EDWARD S. MANSFIELD, *Sec.*, 70 State Street, Boston, Mass.

Edward M. Bragg, who formerly was located with the William R. Trigg Company, ship-builders, of Richmond, Va., has accepted a position as instructor in mechanical and marine engineering at the University of Michigan. The Engineering Department connected with this university has made very rapid progress during the last few years, the increase being at the rate of about 30 per cent a year. A new engineering building is nearly completed for the use of the Department of Naval Architecture and Marine Engineering, which will contain a 300-foot experimental tank for testing ship models and propellers. Mr. Bragg's address is 515 South

12th Street, Ann Arbor, Mich.— W. H. Chenery is also connected with this institution as an instructor in Spanish.—W. A. Wood, electrical engineer, has changed his address from 115 Griswold Street to 69–73 Larned Avenue, East Detroit, Mich.— In a letter written from the United States steamship "Bennington," Charles Morris describes a cruise taken this summer to Alaska and the Russian seal islands, also a stop at Dutch Harbor. Morris is paymaster in the United States navy, and is attached to the Pacific squadron, spending a large part of the time at sea.— On October 13, two nights before his wedding, E. A. Baldwin gave a bachelor dinner to his friends at the Technology Club. The affair was reported a great success.— On October 15 James G. Melluish was married to Miss Ruth E. Kershaw, of Bloomington, Ill. Mr. and Mrs. Melluish have taken up their residence in Bloomington.— W. M. Partridge, of Peabody, Mass., is introducing into the market an invention in the shape of a gas heater which may be used in connection with stoves and ranges for the purpose of using gas instead of coal for fuel.— L. S. Tyler has associated himself with the Maine Electric Company, and has been elected treasurer of the company. They are engaged in the manufacture of electric hoists and special electric machines. They also handle various styles of second-hand machinery. Mr. Tyler's business address is 23 Commercial Street, Portland, Me.— George E. Harkness was married to Miss Lucia V. Jewett at Walpole, Mass., on Oct. 14, 1903. Mr. and Mrs. Harkness are now at home at 12 Donkin Terrace, Savin Hill, Dorchester. — Benjamin Hurd was in Boston the last of November, enjoying a short vacation, which included Thanksgiving and the Harvard–Yale game.— E. C. Atkins, who until recently was assistant superintendent of the Frank Mossberg Company, Attleboro, Mass., manufacturers of special machinery and press work, has again returned to Providence, having accepted the position of superintendent of the machine-shop and drawing-room departments of the Builder's Iron Foundry. His residence is at 385 Potter Avenue.— F. H. Smith, formerly with the Diamond Rubber Company of Akron, Ohio, was one of the promoters of the Milwaukee Rubber Works Company of Milwaukee, Wis., of

which he is superintendent. The company is engaged in the manuacture of mechanical rubber goods, and has its office in the Hathaway Building, Milwaukee, with works at Cudahy, Wis.— F. N. Smalley is now located with the Southern Cotton Oil Company of Savannah, Ga., where he is employed as chemist in the central chemical laboratory, which controls ninety-six mills in all. His present address is 27 Abercorn Street, Savannah, Ga.— E. D. Pingree is married, and has a child about a year old. He is now living in Providence, corner of Lexington Avenue and Hamilton Street, with an office at 814 Banigan Building. Mr. Pingree is now general agent of the Mutual Factory Inspection Company for the Rhode Island territory.— F. E. Guptill was in Boston during the first part of December. He is located in Richmond, Va., with the Richmond Electrical Bureau.

1898.

C.–E. A. Winslow, *Sec.*, Hotel Oxford, Boston, Mass.

J. R. Guy is in the Hull Draughting Department of the Newport News Shipbuilding and Dry Dock Company at Newport News, Va.— Earle C. Emery is with the Bradford Gas Company, Incorporated, at 41 Main Street, Bradford, Pa.— E. F. Kimball has moved from Fitchburg to Lynn, Mass., where his present address is 20 West Green Street.— R. E. Daly is practising dentistry in the Paddock Building, Boston.— G. A. Hutchinson's present address is 743 North Clark Street, Chicago, Ill.— R. W. Pratt, as chief engineer of the State Board of Health of Ohio, is initiating many needed reforms, and has recently strongly urged the installation of a sewage purification plant for the city of Columbus. In conjunction with E. Johnson, Jr., he is studying the condition of the waters of the State for the United States Geological Survey.— J. C. Cook is now in Buffalo, N. Y., where his address is 50 Tracy Street.— H. W. Jones, M.D., has his office in the Linmar Building, St. Louis, Mo.— F. L. Richardson, M.D., has an appointment as house officer at the Long Island Hospital, Boston.—E. Sturtevant has been ill for some

months as the result of a severe attack of appendicitis, but is now better, and expected to return to St. George's School after Christmas.— L. J. Seidensticker was at 27 Maple Avenue, Cambridge, during December, and left for Sinaloa, Western Mexico, about the end of the year.— S. S. Philbrick has gone to Chicago as mechanical engineer with Peabody, Houghteling & Co., First National Bank Building, that city. His work will lie mainly in the inspection of factories and other industrial plants.— A newspaper clipping announces the engagement of J. D. Underwood to Miss Sophie Gates Kerr, of Denton, Md.— G. R. Wadsworth is assistant terminal engineer, having general supervision of the improvements in the New York property of the N. Y. C. & H. R. Railroad including the erection of a new Grand Central Station, the elimination of grade crossings in the Bronx, the improvement of the road bed for some distance out on the Hudson and Harlem divisions, and the change of motive power from steam to electricity within the zone of improvements.—P. B. Wesson has a daughter, Mary Keith, born Oct. 25, 1903.— Miss Eva H. Crane became Mrs. Pliny Blanchard Morrill on Wednesday, Sept. 30, 1903.— D. Churchill was married to Miss Marian Adak Conley on Nov. 1, 1903, in New York City.— Dr. G. H. Wright took the degree of D.M.D. at the Harvard Dental School in 1903, and is now practising at 149 Newbury Street, Boston.— M. V. Ayres has been for the last fifteen months electrical engineer for the Boston & Worcester Street Railroad. He has had charge of the installation of power houses and sub-stations and the equipment of cars, and was largely instrumental in securing the adoption of the multiple unit control system. He is now planning large additions to the power plants and feeder copper of the road.— C. H. Pease is junior partner of the firm of Eastman Pease & Co., engaged in general contracting at 12 Pearl Street. The company has just finished the structural steel work for the Whittier Machine Company's new foundry at South Boston.— A. R. Shedd has had charge during the last year of the inspection of engineering material for the United States Navy Department in the Massachusetts district.— P. Clifford was married in November to Miss Ethel Johnson at the Congregational church, Auburndale. R. Tietig was

best man.— W. R. Strickland has recently moved to New York, where he is in the employ of the N. Y. C. & H. R. Railroad.— F. S. Tucker has been appointed works manager of the Mile End Factory of the Clark Thread company at Newark, N.J.— E. N. Curtis has for the last few years devoted himself very largely to patent law cases, and is gaining a considerable reputation in that line.— A. French has recently been at work under W. Worthington on a $250,000 sewage disposal plant for Swampscott, Mass., having charge of the erection and installation of the machinery.— F. B. Perry is in the Mill Power Department of the General Electric Company, connected with the Boston office. This department has recently been formed for the development of the electric drive in textile mills. He presented a paper on "A Method for Determining Rates and Prices for Electric Power" at the December meeting of the American Society of Mechanical Engineers in New York, which has been widely quoted in the engineering journals.— An informal meeting of '98 was held at the Tech Union December 16, with twenty-two members present. Mr. S. C. Clough was the guest of the evening, and gave a most interesting account of Old Boston, treating especially its topography in primitive and colonial times and tracing the origin of the present streets and the historical significance of their names. After the address, at a brief business meeting, the plans for the class book were considered. It appeared that there was considerable opposition to the publication of photographs of the members of the class, many men holding that the period since graduation is too short to warrant it. It was finally unanimously voted to recommend to the Class Book Committee to omit this feature.— C. H. Pease, chairman of the informal Reunion Committee, announced that in the near future a certain night every month will be appointed as '98 night at the club; and it is hoped that many members of the class will meet at dinner on these occasions.— W. B. Nelson announces his engagement to Miss Marina Hoyt, of Brooklyn, N.Y. The wedding will take place next June. In the last number of *Public Works*, an English journal conducted by the editor of the *Surveyor and Municipal and County Engineer*, C.-E. A. Winslow had an article on

"The Engineer in Preventive Medicine," said article having been specially solicited by the editor.

1900.

GEORGE E. RUSSELL, *Sec.*, 25 Broad Street, New York, N.Y.

Our class has very recently come to the front in a way so remarkable and noteworthy that more than passing notice must be taken of it. As is generally known, the United States government holds, from time to time, examinations for positions of civil engineer in her Navy Department. These positions are fraught with great responsibilities; and the examinations are of the very highest order, requiring marked ability and great preparation for successful passing. This winter there were to be four appointments; and, when the physical examination had thinned the ranks of the applicants, nine men presented themselves for the mental ordeal. From this number three were 1900 M. I. T. men; namely, C. D. Thurber, F. H. Cook, and C. E. Smith. When the appointments were made, it was found that the three 1900 men had each captured one of the four positions,— a record probably never made by any other class or college. Our heartiest congratulations are offered the successful competitors.— On Dec. 25, 1903, a son to Mr. and Mrs. C. D. Thurber, of Glenside, Pa. The showers of congratulatory messages following his successful passage of the United States examinations, and now the advent of so fine a Christmas present, should quite overcome our old friend of Course I.

1901.

EDWARD B. BELCHER, *Sec.*, Quincy, Mass.

The annual class dinner and election of officers was held at the Technology Club on Nov. 18, 1903. In the absence of President Lawrence, Secretary Freeman occupied the chair and introduced the guests of the evening. Professors Cross and Lanza gave the men an idea of the advancement which had taken place in their

respective branches since the graduating of the class. The following class officers were elected: president, Ellis F. Lawrence; vice-president, Ralph S. Loring; secretary-treasurer, Edward B. Belcher; assistant secretary-treasurer, William W. Walcott; member of executive committee, Ralph H. Stearns. At a meeting of the executive committee held on December 4 it was voted to continue the monthly suppers at the Tech Union, which proved so successful last year. These suppers will probably be held on the third Wednesday of every month, beginning with January 20. Notice will be sent to all men living within ten miles of Boston whose addresses are known to the secretary, and any man whose name is omitted from the mailing list is requested to report the omission to the secretary. It is hoped that a large number of the men will avail themselves of this opportunity of renewing old ties.— G. Victor Sammet is studying in Leipzig.— I. R. Morss has recently left for Hancock, Mich., where he will be connected with the management of a street railway company.— S. B. Miller writes from Birmingham, Ala., that he is assistant superintendent of the Sterling Dynamite Company.— W. T. Aldrich, IV., is studying at the École des Beaux-Arts, Paris.— A. B. Campau, IV., has returned from Europe, and is located with Shepley, Rutan & Coolidge, architects, Boston.— George P. Shute has severed his connection with the New York Water Board.— George Taylor Hyde was married to Mary Ruppert Patterson on Wednesday, October 7, at Jamestown, N.Y. At home after November 15 at Pittsburg, Pa.— Walter A. Read, XIII., was married on Wednesday, October 7, to Miss Alice Gertrude Clapp, of Boston. They will be at home after January 1 at 1467 Bedford Avenue, Brooklyn, N.Y.— Fred Ward Coburn was married on October 5 to Miss Edith N. Cheney, of Lowell. They will reside at Sparrow's Point, Md., where Mr. Coburn is connected with the Maryland Steel Company. — Albert Willis Higgins was married on Wednesday, October 21, at Auburndale, to Miss Grace Madeline Adams.— Robert Wiley Bailey, XIII., was married on Wednesday, September 1, at Spruce Creek, Pa., to Miss Mary Bell Thompson.— S. W. St. Clair, IV., was married August 19 to Miss Helen Camille Gagnon. Mr.

and Mrs. St. Clair are at present in Paris.— F. H. Bond, Jr., IV., was married on September 5 to Miss Marguerite Reynolds Harriman.

1902.

CHARLES W. KELLOGG, Jr., 51 St. Paul Street, Brookline, Mass.

There are four marriages and one engagement among members of 1902 to report in this issue. Bertram W. B. Greene was married June 27 to Miss Louise Adèle Bainbridge-Hoff of that city. Greene is living in Aguirre Central, Porto Rico, where he is a sugar planter.— On Oct. 18, 1903, G. H. French was married to Florence Murray in Pittsfield. They are living in New York City now, where the groom is mechanical and electrical engineer with Trowbridge & Livingstone, architects, 424 Fifth Avenue.— George E. Mather was married on Oct. 28, 1903, to Mary Teresa Carpenter in Readsboro, Vt. They are also at home in New York City.— Charles E. McCarthy was married in Lawrence, Mass., on Nov. 24, 1903, to Mary Elizabeth Brady. The couple are at home at 59 Milton Street, Lawrence, Mass.— Redfield Proctor, Jr., has announced his engagement to Mary Sherwood Hendrick, of Salisbury, N.C. He hopes to get married about the middle of January. "Red" is now a director in the Vermont Marble Company and Superintendent of the Power Department of the above-named company.— Richard L. Frost is now with the Draper Company at Hopedale, Mass.— Antonio M. Lage is an electrical engineer with his father's firm of Lage & Co. Mr. Lage, Sr., is one of the most influential men in Brazil.— R. E. Kimball is at present working on the new gasholder which the Riter-Conbey Company are erecting for the Worcester Gas-light Company. His address is 42 Wellington Street, Worcester, Mass.— Arthur T. Nelson has left the Institute to become an inspector in the Philadelphia Navy Yard. Address, 770 South Broad Street, Philadelphia, Pa.— J. A. Robinson is a chemist in La Atalaya, Cuba.— L. R. Stanley is with the Stanley Manufacturing Company, 89 Beach Street, Boston.— Frederick H. Hunter is now in the employ of Frank B. Gilbreth, general con-

tractor, Federal Street, Boston.— Walter P. R. Pember's address is the Grafton, Newton Centre, Mass.— C. R. Cross, Jr., graduated from Harvard last June, and is now at Harvard Law School.— H. H. Saylor is with Potts Brothers' Iron Works, Pottstown, Pa.— Burton G. Philbrick is a biologist on the Metropolitan Water Commission.— C. F. Setz is chemist for the St. Joseph Lead Company, of St. Joseph, Mo.— Francis B. Galaher is in the office of the Supervising Architect, Treasury Department, Washington, D.C.— A. E. Nash is with the New England Bureau of United Inspection as inspector.— Albert E. Lombard is with James L. Lombard, farm land and farm loans, 406 Heist Building, Kansas City, Mo.— Kenneth Locket is with the Chicago Car Wheel and Foundry Company, 4309 Wood Street, Chicago, Ill.— Charles L. Wright is in the Canal Street Station of the Cleveland Electric Illuminating Company, Cleveland, Ohio. Address, 72 Oakdale Street.— Robert V. Brown is with the Sherwin-Williams Paint Company, Cleveland, Ohio.— George Bright, Jr., is assistant supervisor on the Shamokin Division, Philadelphia & Reading Railroad Company.— Lester C. Hammond is in the office of the Supervisor of Bridges, N. Y. C. & H. R. Railroad, Rochester, N.Y. — Edson T. Pollard is acting chief engineer of the Rutland Division of the Vermont Marble Company at Rutland, Vt.— F. P. Montgomery is with the New York & New Jersey Telephone Company, 108 Halsey Street, Newark, N.J.— James Driscoll is superintendent and manager of the rubber department of the S. S. White Dental Manufacturing Company, Prince's Bay, S.I., N.Y. — C. D. Brewer is a mining engineer in the Mining Department of the Oliver Iron Mining Company and the Minnesota Iron Company, parts of the United States Steel Corporation. Address, 2215 East Superior Street, Duluth, Minn.— Clarence D. Starr is draughtsman with the Bureau of Refrigeration at the Louisiana Purchase Exposition. Address, 4537 Lindell Boulevard, St. Louis, Mo.— A. S. More is now assistant engineer in the Maintenance of Way Department of the "Big Four" at Indianapolis, Ind.— W. A. Durgin is with the Terre Haute Electric Company, Terre Haute, Ind.— H. K. Hooker has returned to the Institute to take a degree in

electrical engineering.— J. R. Scott is now manager of the *Manchester Guardian*, of Manchester, England.— Miss Lydia G. Weld is in charge of the tracing-room at the Newport News Shipbuilding and Dry Dock Company, Newport News, Va.— E. S. Baker is with the Cœur d'Alene & Spokane Railway Company, Limited, at Cœur d'Alene, Ida.— H. O. Commins is assistant manager of the Middle Creek Gold Mining Company at Shasta, Cal. He has published from time to time since graduation the following books of short stories: "Welsh Rarebit Tales," "The College Idiot," and "The Little Green Devil."— R. S. Franklin is with A. B. Franklin, heating and ventilating engineer, Fort Hill Square, Boston.— H. L. Green has had three years' experience in St. Paul, Minn., Milwaukee, Wis., and Albany, N.Y. His last position was foreman of the foundry of Rathbone, Sand & Co., of Albany, N.Y.— J. R. Morse is now with The Houghton County Street Railway Company at Hancock, Mich.— H. A. Everett has returned to the Institute as assistant in naval architecture.— H. B. Canby is with Crawford, McGregor & Co., last manufacturers, Dayton, Ohio.— A. E. Hansen is treasurer of the E. M. Porter Heating and Plumbing Company, 139 State Street, Springfield, Mass.— As announced in the last number, the first Class Record Book was mailed to members of the class early in January.

1903.

CLAUDE P. NIBECKER, *Sec.*, Springfield, Mass.

In accordance with the constitution adopted commencement day the "membership in the Class shall be open to all who have taken a majority of subjects with the Class for at least one year, provided always they are members of no other M. I. T. Class organization." On this basis there are over four hundred eligible members to '03. Circular letters, constitutions, and membership cards have been mailed to all eligibles. Approximately one hundred replies have thus far been received, and, what is more promising, several have voluntarily forwarded dues for the coming year. It has been necessary to send these notices to addresses given in

the Institute Catalogue. Many of these are simply boarding-place addresses. There is, therefore, considerable difficulty in locating such cases, particularly if they have not attended the Institute since 1900. If by chance any man eligible to the class who has not received the circular letter before mentioned reads this notice, he would assist the class management by sending in notification to that effect.— On the evening before field day the class had an informal reunion and supper at the Union. No official notice was given, so the attendance of twenty-seven seems satisfactory. The second informal reunion will probably take place in the early part of January. '03 turned out strongly at the Tech night at the Columbia, occupying four boxes, with the '03 placards much in evidence on each box.— The men are changing positions so rapidly that class news is of little value. There are twenty-three of the class at the Institute as assistants in the various departments.— The engagement of Miss Grace Ethel Marsh, of West Newton, Mass., to Mr. Adolph L. Fischer, of Salem, Mo., is announced.— Charles P. Mulherin has left his position with the American Bridge Company at Philadelphia, and has accepted a position with the Ferro-concrete Construction Company, Cincinnati, Ohio.— George D. Wilson is with the same firm.— Charles L. Bates has changed his address from Escanaba, Mich., with the Chicago & North-western, to Matoon, Ill., Maintenance of Way Department, "Big Four."— William H. Donovan is in the St. Louis office of the Sullivan Machinery Company.— George W. Bateman is in Claremont, N.H., for the same firm.— Albert Hamilton is second lieutenant, United States Marine Corps, and is stationed at Marine Barracks, Washington, D.C.— Leroy L. Hunter is at Bellevue, Ohio, with the Pennsylvania lines west of Pittsburg.— Adolph E. Place has returned from Montana, and is located at the Washington, D.C., office of the United States Geological Survey.— Elbert E. Lockridge is in Chicago on the Chicago-St. Louis Drainage case.— F. D. Hayden has resigned his position in the Pittsburg office, Pennsylvania Company, and has received an appointment as government engineer in the Philippine Islands. Hayden takes his wife with him, and expects to remain there from two to three years.

BOOK REVIEWS

HIGH SCHOOL CHEMISTRY IN ITS RELATION TO THE WORK OF A COLLEGE COURSE

By Rufus P. Williams. A paper read before the National Educational Association at its Boston meeting, and published in *Science*, vol. 18, pp. 330–336.

Inquiries sent by the author of the paper to twenty-three colleges have shown that almost all of them require students who have had elementary chemistry in the high school to repeat the subject in college, and that the main objections to the school course are that too much ground is covered, so that the work done is not thorough, that it imparts a knowledge of facts rather than general principles, and that reasoning power is not developed. In view of these facts the author urges close and detailed co-operation between college professors and school-teachers, so as to avoid a repetition of school work in the college course, and emphasizes the paramount importance of teaching more fully general principles and theory. He also makes the specific suggestion that either colleges require as preparation a high-school course of five hours a week for not less than two years in a well equipped laboratory, and then give the student advanced standing in chemistry, or, better, that the high school work extend through only one year and be confined to a thorough study of the non-metals (including salt-formation) and of chemical laws and theories.

The reviewer cannot unconditionally indorse the author's opinion that secondary school instruction in chemistry is defective largely thorough lack of emphasis on general principles and theories; for whether the more extensive introduction of these will be advantageous or harmful will depend on the manner in which they are presented and utilized. For this reason the forcing of instruction in them by college entrance requirements, and even the abstract urging of teachers to include them in their courses,

is likely to be attended by unfortunate results. It is undoubtedly true that there is need of greater correlation of the isolated facts presented to the pupil, and that many opportunities are neglected of broadening his knowledge by laying stress on the general significance of the phenomena he observes; but these defects will not be remedied by an abstract or detached consideration of general principles and theories. Laws should be presented only after the pupil has been made familiar by laboratory work with the concrete phenomena which they generalize, and theories should be introduced only in intimate connection with his experimental work, and only in case they can be shown to be a substantial help in interpreting the specific facts already known or soon to be made known to him. A theory included for its own sake, and without abundant applications to exemplify it, has no appropriate place in either a high school or elementary college course of instruction. Yet existing text-books give sufficient evidence that this is likely to be the way in which theories will be presented if forced into an already overcrowded elementary course.

There is also a great danger of over-appreciating the real value to a person with limited chemical knowledge of even those laws and theories which are fundamentally important from the point of view of the developed science. Thus, at the conclusion of the high-school course, the student will be much better equipped for his future study or for his work in life if the knowledge he has acquired is that of the elementary composition of chemical substances and the quantitative laws pertaining to it, of the properties of acids, bases, and salts, and of the metallic and non-metallic elements, of the constitution of the atmosphere and the functions of its components, of the concrete character of processes like combustion, neutralization, and solution, and of many other such classes of facts, than if he has a familiarity, necessarily imperfect and therefore unutilizable, with Avogadro's principle, the valence and structure theories, the quantitative expression of the Mass-Action Law, the molecular properties of solutions, and the Ionic Theory.

The reviewer does not, however, mean by this statement to imply that these theories and principles cannot be advantageously

introduced by a teacher who understands how to make them a help in the interpretation of the facts studied by the pupil rather than additional subjects to be mastered; but he wishes to emphasize the idea that from the point of view of elementary education they are not of primary importance, and that they are to be used only as aids in acquiring knowledge and in awakening interest.

The main aim of the high-school course should be: first, to give the pupil a concrete knowledge of the properties and behavior of the important chemical substances and of the character of the fundamental chemical processes; and, secondly, and this is still more essential, to train him in scientific method,— to experiment carefully, to observe accurately, to draw the logical inferences, to correlate new phenomena with those of his previous experience, to imagine possible explanations of them and ways of testing these, and to solve new problems of a suitable degree of simplicity whereby his interest and originality may be developed. The teaching of generalizations remote from the pupil's experience and of theories without immediate appplicability to his store of knowledge must not be allowed to consume the time needed for a thorough training in the directions just mentioned.

To the author's plea for closer co-ordination between the chemical instruction in colleges and that in high schools, and to his contention that the attempt is made to cover too much ground in the courses of the latter, the most cordial indorsement may be given.

ARTHUR A. NOYES, '86.

THE MAN OF MOUNT MORIAH

BY CLARENCE MILES BOUTELLE. pp. 300, double column. Illustrated. Chicago: John W. Brown & Co. Price $1.00.

The story deals with the building of King Solomon's temple and the institution of Free-masonry. Our grandmaster, Hiram Abif, is the hero; and we eagerly follow him through his temptation by Satan and Belleju, through his trials and tribulations with the defiant and troublesome workmen, his visits to the various lodges, through the

ceremonies incident to laying the corner-stone, and later the consecration of the Temple, and finally to the Holy of holies whence he passed out by the South Gate.

The story is unusually well told, and interesting alike to the brethren and the uninitiated, to the former for the way in which some of the Masonic tradition and ritual are introduced, to the latter in the hope that they may learn some of the mysteries of Freemasonry which still remain in their first repository.

Nor is it interesting as a simple novel. It has a higher mission than simply to entertain: it is uplifting, full of spiritual truths and teachings.

The reviewer felt a genuine regret when it was finished, and also that the jewel should have such a poor setting of "heavy paper covers." A. H. Gill, K.T.

WOMAN'S WORK IN MUSIC

By Arthur Elson. Boston: L. C. Page & Co.

Mr. Elson has gathered a goodly lot of female composers and performers in this book, and gives more or less information in regard to each of them. The notes in regard to Mrs. Beach, Mlle. Chaminade, Augusta Holmes, Mrs. Meadows-White, and others, are interesting, and present the claims of women to recognition as constructive musicians in a strong manner. One can hardly help wishing, however, that the author had treated a few of the greater names more at length, and had relegated the host of minor ones to the list of "also rans." About five hundred women are mentioned as composers, America being represented by one hundred and twenty-nine. S. F. T.